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[OFFICIAL NOTICE.]

Annual Meeting of the New England Association.

The Seventeenth Annual Meeting of the New England Association of Gas Engineers will take place, at Young's hotel in Boston, on February 16 and 17, 1887. The meeting will be called to order by the President, Mr. John P. Harbison, on Wednesday, at 10 o'clock, A. M.

This meeting bids fair to equal any which have been held in past years. From the letters received by the Secretary, a great deal of interest is felt, and the attendance promises to be large.

Six papers have now been promised by the following gentlemen:

Mr. C. J. R. Humphreys, "Some Thoughts on Purification by Oxide;" Hon. A. M. Norton, "Effects of Reduction in Price of Gas;" Mr. E. G. Pratt, (subject not given); Mr. C. F. Prichard, "Candle Power and Illumination;" Mr. F. S. Richardson, "On Introducing High Candle Power Burners;" Mr. R. B. Taber, "Candle Power and Illumination."

From the well-known character of these gentlemen, it is safe to say, a very interesting set of papers will be presented.

It is proposed to send each member of the Association a short synopsis of the papers, a few days before the meeting, so that all can come prepared to take an intelligent part in the discussion.

It is hoped and believed that the facts that will be brought out in the papers and the discussions, will add a material quantity to the present knowledge of the gas business. CHARLES H. NETTLETON, Sec'y.

SHOULD THE SUPPLY OF WATER GAS FUEL BE PERMITTED.

Despatches from Troy, N. Y., bearing date of Jan. 17th, were well calculated to attract widespread attention, but the notoriety secured was gained at a most painful expense. Three persons were destroyed when seemingly engaged in ordinary conversation, while over a score of others were more or less severely prostrated, and the cause of all this suffering was instantly traced, once the wheels of investigation were put in motion, to an accidental inhalation of the fuel water gas distributed from the works of the Troy Fuel Gas Company. Briefly stated the leading facts appear to be the following:

About 7 P.M., on Sunday, January 16th, a young woman (Rose Stone) employed as a domestic in a restaurant owned by C. C. Howe—it is located in the Crowley building, on south side of River street, and quite close to the manufacturing plant of the fuel gas works—was seized with a seemingly inexplicable fit of illness. Bewildered and apparently unable to make known her condition to those close by, she rushed into the open air, gaining egress to the rear yard through an open doorway, and fell to the ground in a fainting condition. Jno. Talmage, a son-in-law of the restaurant keeper, startled by the strange conduct of the girl, Stone, followed closely in her wake, and at once instituted measures for her revival. A young daughter of Talmage was now taken sick, and the father, who speedily succeeded in his attempts at restoring the first victim to consciousness, while performing similar offices over his daughter, succumbed. The restaurant keeper (Howe) who was in another portion of the house, was found by Mrs. Talmage—she seems to have been the one who suffered least—in a dazed condition; and he exclaimed to her, "I guess I am going to die." To make an end of the preliminary statement, eleven persons in the Howe domicile were more or less prostrated, and all complained of similar symptoms—headache, nausea and drowsiness. A physician (Dr. Martin) was summoned, and he rather astonished the inmates of the plague-stricken spot—temperature of the outer air was extremely frigid—by at once throwing open all the windows and doors. Turning his attention to the sufferers, Dr. Martin explained to them that they had inhaled gas, which they stoutly denied. No gas was used on the premises, and none of the odors characteristic of gas had been perceived by them. However, the Doctor on previous occasions had been called upon to relieve similar cases, and he asserted that the street pipes of the fuel gas company must have been fractured. That being the case, the escaping gas—the top crust of the earth being frozen stiff—followed through the lower strata and entered the cellar of the restaurant, subsequently finding its way to the upper apartments of the building. The gas—it is a simple uncarburetted fuel gas, manufactured under the Lowe process—being odorless, performed its work unperceived by the sense of smell. The houses Nos. 395 397 River street were next examined. The first, a saloon, was found to be untenanted—Dr. Martin arrived on the scene at 9 P.M., and the outside investigation was commenced, say, at 10 P. M.—but a startling state of affairs was brought to light at No. 397. The front door was locked, but the investigators entered a side alley, ascended a narrow flight of steps that led to a

covered porch and landing and stood before a door opening into the second floor. This was locked, but, repeated knocks failing to elicit a response, the barrier was broken down and an entrance effected. In the kitchen was seen the form of an elderly woman, apparently asleep in an arm chair. A set of false teeth was clenched in one hand, but there were no evidences of a life and death struggle. However, the woman was dead. Hurrying on to the front apartment, the dead body of a second female, lying on the floor with a blanket wrapped around her, and a tin slop bucket placed near her head—she had evidently tried to vomit but could not—was discovered. In the same room, sitting upright on a lounge, with fingers locked and his hands resting on his knees, was found the dead body of a male person. The corpse was dressed in ordinary clothing, with the exception that the feet were shoeless. The victims were subsequently identified respectively as Mrs. Caroline Bennett; her daughter, Mrs. Wm. Gilfillan; and Charles Pratt, a visitor of the younger woman. At No. 397½ and several other houses on the line of River street the inmates had suffered more or less severely; but fortunately knowing to what cause to attribute their illness, these adopted proper measures for relief.

At the instance of Dr. Martin, shortly after his arrival at the Howe restaurant, word of the break in the mains was sent to Supt. Geer at the fuel company's works, and the current was at once shut off. One of the most peculiar features of the case is the varying manner in which different physical systems were affected. Mr. Barnes, an electrician, was reduced to such an extremity that he was only saved by the presence of mind of his wife, who, to use Mrs. Barnes' words, "put the battery on him;" but Mrs. Barnes herself, subjected to precisely the same influences that prostrated her husband, and hovering over his very person, was affected but slightly—that is, when compared to the state to which he was reduced. It might be explained that Mr. Barnes and his wife reside at 399 River street.

To recapitulate, it seems that not less than 20—in all probability 30 would be nearer the mark—persons were more or less affected by the gas, and that 3 victims answered with their lives. It is horrible to contemplate what the actual result would have been did it so happen that the gas failed to manifest itself, or rather to reach to the altitude gained by it at 7 o'clock, until, say, four hours later, or when those subjected to its insidious attack were wrapped in sleep. Troy would have been treated to a genuine holocaust, save that instead of the victims having been destroyed by fire fuel gas would have been the responding destroyer. There can be no quibbling over the Troy disaster. The proper source is made plain through the result of the coroner's preliminary investigations, and in the subsequent admissions of Mr. Geer, of the Fuel Gas Company, as well. In fact, perhaps the results developed at the autopsy ordered at the coroner's request have never before been paralleled in this or any other country. Drs. Bouticon and Morris, while in the act of opening the bodies, were nearly overcome by inhaling the gases that escaped from the vitals of the subjects, and in fact the first-named physician was so seriously affected that he had finally to retire from the operating room before the dissection was completed. It should be borne in mind that the occurrence of January 16th was not the initial warning that had been given to the people of the city in the matter of the noxiousness of the gas sent out from the offending establishment. Plenty of such warnings had been received, notably one that, if memory serves aright, occurred on January 5th. On that date—luckily the affair happened shortly before noon—some 15 persons were more or less affected from inhaling gas that had entered their stores and houses in a manner precisely similar to the way recounted above. Again, on a day in last fall, many of the workers in the laundries—the operators of these establishments are extensive users of the fuel gas—were striken down from the effects of the gas. But these latter instances attracted no particular attention, simply because no fatal results ensued. The latest disaster, however, provoked prompt action, and at a special meeting of the Council, held on January 18th, the franchise granted the fuel company was suspended; but in justice to the managers of the company it should be explained that they voluntarily suspended active operations prior to the Council's action. Judging from the present temper of the Troy authorities it is quite likely that an exhaustive examination of this subject will be carried out to completion, and the final outcome will be awaited with interest.

While not desirous of influencing or anticipating the verdict which will ultimately be arrived at, we submit that the case as it stands looks bad for the fuel company. The Superintendent, Mr. Wm. Geer, is reported by the Troy *Daily Times*, in its issue for January 17th, to have said, in the course of other explanations volunteered by him in regard to the terrors of the previous day: "We used the old steam heating company's pipes"—the fuel company purchased the plant and franchises of the defunct Troy steam heating company—"in some places, and that caused the trouble. We have had no break in our cast iron pipes; they don't leak. All the trouble is with the wrought iron pipes. There is an odor to the gas, but it is so faint that it can scarcely be detected near a fixture where there is a leak. Our gas can be odorized by putting in naphtha or carbolic acid." If Mr. Geer is reported correctly, and there is no reason to doubt it, his employers will be called upon to shoulder a grave responsibility. They permitted the use of mains, notoriously defective, for conveying in large quantities and at heavy pressures an odorless (or practically so) gas which certainly carries in it not less than 40 per cent.—we are convinced, from the mode of manufacture pursued at Troy, that 50 per cent. would be nearer the truth—of the virulent poison, carbonic oxide. Further, the promoters (through Mr. Geer, who ought to know about it, if anyone does) admit that a distinct odor could be imparted to the gas by treating it with either naphtha or carbolic acid; but as neither the one nor the other of these substances was employed, we can draw but one conclusion. That conclusion is, naturally, predicated on the fact that the cost of the impregnated article would be in excess of the "unadulterated" product, whose baneful potency will be vividly remembered in Troy for many a day. It is needless to say that cheap fuel gas is a desideratum; but we are not prepared to admit that its importance is of such pressing moment as to call for the vending of an article, even be the methods of its distribution approximately secure, that takes foremost rank in the list of poisons. In taking present leave of this disagreeable subject we would remind our readers that, despite the immense quantities of fuel gas used in the regions where natural gas is obtainable, we have yet to hear of a single death from gas asphyxiation in those localities; and is not that immunity fairly attributable to the fact that analysis reveals an extremely low content of carbonic oxide in the gaseous product evolved from nature's laboratories?

[Since the above was written the verdict of the coroner's jury has been received. It attributes the disaster to the negligence of the fuel gas company, and recommends that an exhaustive examination be made by the authorities.]

THE ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION.

The forthcoming annual meeting of the New England Association—the Seventeenth yearly gathering it will number on the roster—bids fair to be a more than ordinarily interesting session. In the first place, we can expect to hear something of importance and interest from the lines of President Harbison's inaugural address, and we can, from our understanding of that gentleman's skill and ability, added to his thorough knowledge of, and adroitness in, the matter of guiding large gatherings safely through the mazes and meshes of parliamentary law and rulings, predict that the gavel is to be wielded by a master hand. But even though the directing reins are sure not to sag listlessly over the footboard, the road would seem long were we not sure of a succession of changes by the wayside. These "changes" will no doubt be pleasantly supplied by the authors who have signified to Secretary Nettleton their intention of contributing papers. As this list, or a partial one at least, has appeared in the Secretary's official announcements, printed from time to time in our columns, we must leave our readers to decide whether or not the literary pabulum will be fit for the feast. We cannot forbear, however, in expressing our gratification at seeing Mayor Norton's name down for a paper, and he surely will throw some light on that vexed question, "Effects of Reduction in the Price of Gas." The members, of course, will see to it that Secretary Nettleton's hope, in regard to a large attendance, will become a certainty when President Harbison's gavel proclaims the opening of the sessions.

DEATH OF MR. WM. MERRICK.

Not quite a year ago we were called upon to chronicle the sudden decease of Mr. James Dwight Brewer,* who, a fortnight before, had refused to accept a re-election to the treasurership of the Springfield (Mass.) Gas Light Company. The office thus vacated was filled by Mr. Wm. Merrick, son of Solyman Merrick, the latter gentleman having been the first occupant of the Presidential chair of the Springfield Company. The now-deceased son maintained intact his father's interest in that enterprise, and, as said before, succeeded the late Mr. Brewer. The subject of this brief note was born in Springfield, Sept. 10th, 1849; took his preparatory course at Prof. Charlier's New York Academy, subsequently graduating from Harvard in the class of '70. He afterwards completed a course in architecture at the Boston Institute of Technology. We have no record that he ever married, but at any rate his next of kin is an aunt. Deceased lived an extremely simple, unostentatious life, and, therefore, in saying the above we have about exhausted his history in so far as it relates to that which the public has the right to hear. However, if his life was simple, it was also beautiful and peaceful—filled with harmony and void of passion. That he was generous is best illustrated by uncovering the secrets of his will, which instrument provides for the equable distribution of a large estate. To show how his fellow workers held him we here reprint the closing paragraph of a set of resolutions passed by the Board of Directors of the Company he had served:

"*Resolved*, That in Mr. Merrick's death this Company loses a valued and efficient servant; its patrons a courteous and accommodating officer; this city a generous and exemplary citizen; and humanity a friend."

*Mr. Brewer died on Feb. 7, 1886; and Mr. Wm. Merrick's death occurred on Jan. 17, 1887.

[A Paper read before the Society of Gas Lighting.]

Gas and Electric Lighting Supply: Shall they be Combined?

By Jos. R. Thomas.

A subject now being seriously considered by many of the most studious and prominent gas engineers of our country is the following: "Will it be for the best interests of the companies we represent to install an electric lighting plant as an adjunct to our apparatus for making gas, in order that we may be in position to furnish either or both descriptions of light wherever the same may be called for?"

A satisfactory solution of the foregoing problem can only be achieved by patient study and careful analysis, for the first step involves the traveler in the necessity of pointing his course over roads unmarked by the guide posts that hitherto led him on in security. The often flippant, and always boastful, claims of those who, for lack of better description, may be termed "commercial electricians," are one thing, and you will readily grant me cannot, therefore, be acccepted as sufficient guides to convince us of the "straightness of the path." Hence we must yet grope our way, and be content even if our ratio of progress is but slow; for it should be borne in mind that the race is not always awarded to the swift.

Much may be said in favor of an affirmative answer to the afore-mentioned query, and possibly about as much may be urged in the negative; but a prime factor that must enter into the consideration and decision of the question, in every case, is the situation and surroundings in which the individual questioner finds himself placed. Local circumstances, therefore, must alone determine the nature of the step to be taken. That this is so is instantly apparent when we come to compare the views of gas managers who have thought about the matter. Some are unhesitatingly prompt and enthusiastically certain over the benefits to be derived from the working of a combined plant; and their prognostications as to the future of the artificial lighting business are leavened by the assertion that if success is to be maintained the dual system must be pursued. On the other hand we find that about as many are disposed to reject the rose-colored presentation of the subject, and the opponents shade their belief with more somber hues; but these, while indisposed to concede that the combined plan is necessary for the future preservation of their lighting supply supremacy, are willing to admit that the new departure may in some respects be accepted as holding forth valid reasons for its adoption. Again, we find a third division, whose supporters with blind persistence refuse to consider the question in any shape or form, and thus ignore the thing completely. It is not my province to say which of the three classes contains the orthodox set; but I may be permitted to enroll myself in the ranks of the middle division, and to frankly confess that my conversion from the "faith of the stubborn" is of comparatively recent date.

With such a variety of opinion existing, it would seem that a final settlement of the matter is well under way, for honest antagonisms, heterodoxical as that may sound at first, are but the struggles of those who seek the truth.

It is a plain matter of fact, and so well worthy of consideration as a cause for hastening decision, and its remembrance may help to that end, that the business of electric lighting has made rapid progress in our cities, towns, and even villages during the past two years. I do not propose to weary you with the ways and means by which this progress has been effected, or to retell the corrupt methods unfortunately so often pursued by the public authorities in connection with their government of even the smallest localities. But if that progress was, in some or any measure, fostered by corruption, it nevertheless was effected; and so we must accept it as an issue of the day and time. To explain here, the writer does not wish to be understood as asserting that, so far at least, the advance in electric lighting has been secured at a corresponding loss to the craft of the gas maker in the matter of the latter's sendout. On the contrary I think, and have reason to know, that the electric lighting furore has created a desire for a greater volume of light. The people, as a rule, would not be satisfied now with the amount of illumination that they formerly accepted as sufficient for their needs, and the revolution can be traced, in great part at least, to the brilliant if pale glare of the voltaic arc.

One important effect upon the gas industry in any city or town blessed by the possession of two or more competing electric lighting companies is that the local gas supplier is as liable to suffer from the effects of that struggle for business as if he were himself engaged in the strife. In fact, I believe the situation in which he is thus placed is nearly identical to what would be caused from the efforts of a competing or opposition gas company. Under such circumstances the owners of the gas company, in order to protect their interests, might see their way clear to taking a hand in the contest by adding an electric plant to their apparatus. One of the greatest inducements, however, to cause the operation of a combined plant—particularly in our larger cities—is that we find quite a number of consumers who are evidently earnest in their desire for electric light. These say they want it under any circumstances, and will have it at any price; and since it is quite useless to seek to curb the ways of fashion, one may take advantage of its foibles in order to extract profit from ministering to its weaknesses.

It is of course certain that if electric lighting can be furnished so as to prove remunerative to distinct individuals or to incorporated assemblies, owners of gas companies can supply it still more advantageously, in that they can work more economically. A slight glance at the conditions existing proves the last proposition. There are very few gas companies in this country with whose ground plan I am familiar that are not possessed of sufficient space to admit of the installation of an electric lighting plant. Many of them own buildings well adapted, without the need of a single change, for the purpose, while others would require only a very slight expenditure to fit them exactly for their new duties. Some of the surplus fuel, which at times is a mere drug on their hands, could find a ready outlet in the new order of things, and thus a better and more stable market be maintained for the balance. The clerical work required to keep up the accounts of the new departure could be found nearly, if not quite, in the staff already maintained; and so it would be in almost every practical item connected with the added establishment. It would seem, therefore, that the extra expenses or charges to be incurred in the installation by gas companies of an electric plant would be: Capital and interest; cost of plant and wear and tear of same; labor required in production and distribution. These items would have to be charged against an independent electric company, whereas the latter would not have the compensating or decreasing offsets of cheap fuel, no salaried officers, no office or ground rent, etc., that would adhere to the proprietors of the combined gas and electric light undertaking.

In thus setting forth my views I wish to be distinctly understood that not a doubt exists in my mind on the subject that gas, for illuminating purposes, in respect of volume for volume of light, can be furnished much more cheaply than can electricity. The absurd statement made by one or two of the incandescent promoters, that their pet light can be made to successfully compete with gas sold at the rate of $1 per thousand cubic feet, should be accorded the credence given to the recent claim of a "wild westerner" who is now ready to furnish any company with a gas making plant guaranteed to produce an illuminating vehicle, of extraordinary diffusibility and high candle power, that can be placed in the holder at a cost not to exceed six cents per thousand cubic feet. The only wonder is that these visionaries find seemingly sensible people who will waste time and money in the investigation of such patented fallacies.

That great improvement has been made in the matter of perfecting electric lighting apparatus we all must admit, and one pleasing effect of that advance has been the impulse given to inventors at work on the problem of developing the inert (for want of a better term) properties of gas. While the matter may be considered foreign to the subject of the present paper, and even at the risk of seeming to improperly advertise anyone's wares, I will venture to recall to your mind the exceedingly beautiful illumination of a portion of the Hotel Lafayette, Phila., Pa., during the progress of the last annual meeting of the American Gas Light Association. The Lungren burners employed on that occasion show what may be accomplished by an intelligent use of gas, and I regret to add, speaking for New York city, that a greater number of them are not to be found in operation there. Neglect or indifference on the part of gas men accounts somewhat for the hold obtained by the electric light, and no matter whether you decide sooner or later to embark in the business of conjoint gas and electric light supply, do not foster the latter at the expense of the former, for it is, after all, as gas makers that you must count for success. Granting that electricity, as officially stamped by one who made incandescent lighting a practical success—Mr. T. A. Edison—is the light of the rich, gas is now more than ever the light of the poor—a state of affairs which is not sought to be changed by those interested in its manufacture and supply.

Liquid Fuel.

By Lewis T. Wright, F.C.S.

[A paper read by the author—who is General Manager of the Nottingham Corporation Gas Department—before the Nottingham Section of the Society of Chemical Industry, on Monday, Dec. 13, 1886. For our report of same we are indebted to the *Journal of Gas Lighting*.]

In 1883 I had the honor of addressing the Manchester Section of this Society on the subject of "Gaseous Fuel"—a subject then of absorbing interest, and the theme for numerous papers. The attention of the technical world now seems likely to turn to "liquid fuel," since we are threatened with a deluge of petroleum, which would, no doubt, be an accomplished fact if it were possible for this material to be delivered at such a price as to enable it to compete with our cheap English coals. The excellent paper read before the London Section of this Society in 1885, on "The Russian Petroleum Industry," by Mr. Boverton Redwood, has given us an idea of the enormous quantities of petroleum seeking a market; but we have yet to learn the lowest price at which it can be delivered in this country, for on the price de-

pends, of course, whether or not it can successfully compete with coals. Mr. Redwood states that at Nobel's works 1 lb. of petroleum residue evaporated 14½ lbs. of water in a boiler provided with Nobel's trough burner, and 12 lbs. when injected into the furnace by steam; whereas coal was only equal to from 7 to 8 lbs. of water. It is probable that the coal employed was not of the finest quality. I do not know what the constitution of the petroleum residue may be; but the higher classes of petroleum are surely the most concentrated fuel, weight for weight, we can hope to find. Whilst the American petroleum oils are principally hydrocarbons of the paraffin series, the Russian appear to be mostly pseudo-olefines, naphthalines, and benzine oil hydrocarbons. You will remember that the hydrocarbons of the paraffin series up to heptane have positive heats of formation; and from the regular progression presented by these bodies, as far as they have been investigated, we may conclude that the higher members of the series also have positive heats of formation, and yield on combustion less heat than would be indicated by their elementary composition, or calculated according to Dulong's formula. Methane, the first member of the series, yields on combustion about 11 per cent. less heat than would be given by the same amount of carbon and hydrogen in the free state; hexane, about 6 per cent. less. The members of the olefine series at present studied have either negative heats of formation or very small positive ones. Of the acetylene series, the two first members—viz., acetylene and allylene—have negative, and diallyl (C_6H_{10}) a small positive heat of formation. Naphthaline, anthracene, and benzine appear to have negative heats of formation. I mention these matters as I think it probable that, carbon for carbon, and hydrogen for hydrogen, the Russian will be found to yield more heat than the American petroleums.

As engineers, we labor under the difficulty of being compelled to employ an empirical formula for the calculation of the combustion equivalents of our fuels; and this difficulty can only be removed when the chemists have had time to determine for us the true calorific values of the materials we employ as fuels. Until then we shall have to avail ourselves of Dulong's formula, with the mental reservation that it is likely to give results perhaps 8 per cent. from the truth. It is well known that most coals at present investigated yield in the calorimeter higher results than are obtained by calculation. However, there are exceptions. I find that 14 coals examined by MM. Scheurer-Kestner and Meunier in their calorimeter give an average result 9 per cent. in excess of the average calculated values. The coals examined by Herr Ferd. Fischer in his boiler trials also gave about 7 or 8 per cent. more in the calorimeter than was calculated from the elementary composition (Wagner's *Jahres-bericht*, 1883 5). I have not had any experience of petroleum as a fuel; but I venture to make a theoretical comparison between it and coals. The average composition of 15 petroleums from various parts analyzed by M. Sainte-Claire Deville was—

Carbon	84.7
Hydrogen	13.1
Oxygen	2.2
	100.0

This gives a theoretical evaporative power per pound of 19.63 lbs. of water from a temperature of 100° C. at atmospheric pressure, reckoning the water formed on combustion of the hydrogen to be in the gaseous condition, thus—

$$\frac{84.7 \times 8080 + \left(13.1 - \frac{2.2}{8}\right) 28{,}780}{536.5 \times 100}$$

(The theoretical evaporative power will always be expressed on this basis.) In a good boiler we may expect to get into the water 80 per cent. of the calculated heat of combustion of such a class of fuel. We should then have an actual evaporative power of 16.74 lbs. of water; but as about 5 per cent. of the water evaporated would be required to operate the injector, if the petroleum were worked on this system, we should have a net evaporative power of 15.70 lbs. of water. This estimate gives petroleum, weight for weight, 39 per cent. more evaporative power than coal of a practical evaporative power of 11.3 lbs.

Mr. D. Kinnear Clark, in his "Manual of Rules and Tables," falls into a singular error in his notes on "Liquid Fuels," and credits some petroleum oils with a theoretical evaporative power of 29.08 lbs. A glance at the formulæ and elementary composition of his petroleum oils will immediately cause the error to be disclosed. In his otherwise useful manual the custom of calculating the combustion values of the fuels on the basis of the water formed on combustion of the fuel being liquid is objectionable, as it operates unfairly against those fuels which contain but little hydrogen, and is a condition not to be arrived at in practice. No doubt some of the purer petroleum distillates might give one or two pounds more than this figure; but would they not be commensurately dearer? A crude petroleum of .87 specific gravity would measure 257½ gallons to the ton of 2,240 lbs.; and at 1d. per gallon would be equivalent to a coal of the above-mentioned quality at 15s. 6d. per ton, without reckoning anything on account of a saving in labor of firing, and other advantages which liquid fuel possesses—such as getting more work out of the boiler, etc. It is impossible to assign any value to these, as everything would depend upon particular circumstances. Of course, if it were found that trough burners could be successfully employed, then the comparison would be much more favorable to the petroleum; but petroleum at 1d. per gallon is at present a thing only to be dreamt of. There are other liquid or semi-liquid fuels produced in this country at a very low price—such as tar oils and tar; and the attention of engineers and manufacturers who require intense and regular heats should be directed to these.

The results of the boiler trials I have made with tar and creosote, and which were casually mentioned in a paper I read before the London Society on Nov. 1 of this year [1886], I now propose to bring before your notice. The results in the paper referred to were given for actual working conditions—viz., feed water at 12° C. (53.6° F.), and 40 lbs. steam pressure. The boiler was a two-flued Galloway boiler, 28 feet long, 7 6 feet in diameter, and of the best modern construction:

Class of Fuel.	Number of Days' Trial.	Water Evaporated from 12° C. at 40 lbs. Steam Pressure.	Water from 100° C. at Atmospheric Pressure.
Nottinghamshire top hard cannel	Eleven.	7.40	8.78
Silkstone gas coal	Seven.	8.42	10.01
Coke from top hard cannel	Six.	8.34	9.91
Silkstone gas coke	Six.	9.49	11.15
Tar, steam injected	Seven.	10.70	12.71
Creosote, steam injected	Nine.	11.24	13.35

I give coals and coke in this table for the purpose of comparison.

I will now give the elementary composition of the materials employed, and their calorific values calculated according to the usual formula—

$$\frac{C \times 8080 \times \left(H - \frac{O}{8}\right) 28{,}780 - (H_2O \times 600)}{536.5 \times 100}$$

The carbon, hydrogen, oxygen, and moisture, etc., being expressed in percentages, and the results being given in units by weight of water evaporated from 100° C., and atmospheric pressure per unit weight of fuel.

The Nottinghamshire top hard cannel employed has the following elementary composition:

Carbon	67.0
Hydrogen	5.6
Nitrogen	1.2
Sulphur	1.0
Water	7.6
Ash	6.6
Oxygen	11.0
	100.00

$$\frac{67 \times 8080 + 28{,}780 \left(5.6 - \frac{11.0}{8}\right) - (7.6 \times 600)}{536.5 \times 100} = 12.27.$$

and would therefore have a theoretical evaporative power of 12.27 lbs. of water per pound of fuel.

The composition of the Silkstone coal was as follows:

Carbon	79.0
Hydrogen	5.2
Nitrogen	1.5
Sulphur	1.5
Water	4.0
Ash	2.8
Oxygen	6.0
	100.0

$$\frac{79 \times 8080 + 28{,}780 \left(5.2 - \frac{6.0}{8}\right) - (4 \times 600)}{536.5 \times 100} = 14.24$$

with a theoretical evaporative power of 14.24 lbs. of water per pound of fuel.

The top hard cannel coke was composed of—

Carbon	80.1
Hydrogen	0.6
Nitrogen	1.3
Sulphur	0.4
Water	4.1
Ash	11.9
Oxygen	1.6
	100.0

$$\frac{80.1 \times 8080 + 28{,}780 \left(0.6 - \frac{1.6}{8}\right) - (4.1 \times 600)}{536.5 \times 100} = 12.23$$

with a theoretical evaporative power of 12.23 lbs. of water per pound of fuel.

The Silkstone gas coke consisted of—

Carbon	89.0
Hydrogen	1.0
Nitrogen	1.0
Sulphur	1.2
Water	1.2
Ash	5.2
Oxygen	1.4
	100.0

$$\frac{8080 \times 89 + \left(1.0 - \frac{1.4}{8}\right) 28{,}780 - (1.2 + 600)}{536.5 \times 100} = 13.82$$

with a theoretical evaporative power of 13.82 lbs. of water.

The following was the composition of the tar:

Carbon	80.2
Hydrogen	7.0
Nitrogen	0.8
Sulphur	0.5
Oxygen	11.5
	100.0

$$\frac{8080 \times 80.2 + \left(7 - \frac{11.5}{8}\right) 28{,}780}{535.5 \times 100} = 15.06$$

with a theoretical evaporative power of 15.06 lbs. of water.

The creosote was composed as follows:

Carbon	87.4
Hydrogen	7.3
Nitrogen	0.3
Sulphur	0.5
Oxygen	4.5
	100.0

$$\frac{8080 \times 87.4 + \left(7.3 - \frac{4.5}{8}\right) 28{,}780}{536.5 \times 100} = 16.78$$

with a theoretical evaporative power of 16.78 lbs. of water per pound of fuel.

The following table gives the percentage of theoretical evaporative power actually obtained:

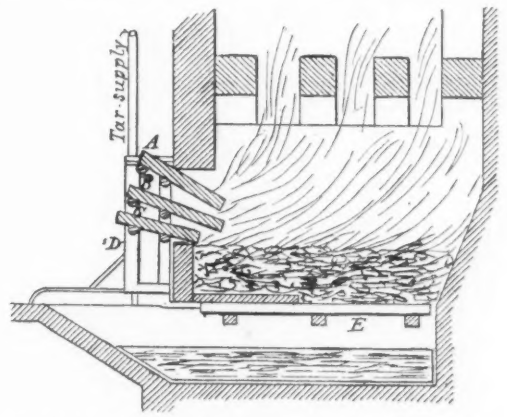
	Actual.	Calculated.	Per Cent.
Nottinghamshire top hard cannel	8.78	12.27	71.56
Yorkshire Silkstone coal	10.01	14.24	70.30
Top hard cannel coke	9.91	12.23	81.03
Silkstone gas coke	11.15	13.82	80.68
Tar, steam injected	12.71	15.06	84.40
Creosote, steam injected	13.35	16.78	79.56

It will be observed that the coals come out low; the coke and tar very well; while the creosote occupies an intermediate position. It is also important to bear in mind that the coals examined by Scheurer-Kestner and Fischer were really 7 to 9 per cent. better than by calculation; but I cannot say that this would also apply to the coals used. The creosote results agree fairly with some I have had the privilege of seeing, that were obtained in the London district, and also in the neighborhood of Nottingham; but as I have no information about the boilers employed, a close comparison is not possible. Creosote is an excellent fuel for boiler firing, and easy to manipulate. It requires to be warmed if it contains much "tar salts," to dissolve the naphthaline, etc. Tar is rather more difficult to manage with ordinary forms of injectors, as the peculiar orifices employed are extremely liable to obstruction with this viscous fluid; and there is a tendency to produce smoke if the flow is irregular.

For the purpose of injecting these liquid fuels into furnaces a great number of injectors have been invented. If they materially differed in principle the study of them would be perfectly bewildering; but as they are almost all alike, their study is really very simple. The one on the table before you is perhaps the simplest form. It is one that I have designed, and have called a "spray burner;" and it consists of one tube, carrying the steam, placed at right angles to another carrying the liquid fuel, in the fashion of those scent sprays that were, and perhaps are now, very popular for distributing scent in rooms. These injectors are said to require about 5 per cent. of the steam made to work them, and suffer from the obvious difficulty of not being able to raise the steam wherewith to start themselves. A supplementary boiler fired by other means would have to provide this in the first instance. There is no doubt that the oil could be burned without steam at all, after the manner of Nobel's trough burner. I have tried an arrangement similar to the one I shall shortly describe for retort furnaces; but it was not large enough to be able to consume sufficient oil to evaporate anything like the usual quantity of water. Up to this point, however, the combustion of fuel was very perfect, and gave great promise for an extension of the system. The flame from these oils is very fierce, and it is no doubt advisable to place a ring of firebricks as a lining for the parts of the boiler which are in the immediate vicinity of the flame, and firebrick shields in front of the first tubes, if the boiler is of the Galloway type. The grate also needs covering with either a dense bed of ashes or fire-tile; and the lower half of the flue below the grate should be closed with a metal shield. I am inclined to think it would be preferable, if the use of oil were intended to be permanent, to employ a fire-box of firebrick outside the boiler, with a furnace of the type to be described hereafter, and lead the flue into the boiler flues.

The attention of gas engineers has been forcibly directed to the use of tar as a fuel for the firing of retorts, now that this once high-priced material is suffering like everything else (but perhaps to a more marked extent) by what is called "depression in trade." In fact, it has in many places reached so low a commercial value that it is profitable to burn it as a fuel. Happily this is not the case at Nottingham; and our interest in tar as a fuel is more experimental, in view of what may happen if a further fall in tar products sets in. I have abandoned the use of steam injection for our experimental tar fires, in favor of another system I am going to describe. The steam injectors produce excellent heats, but are rather intermittent in their action; and the steam they require is a serious item, and not always available.

Tar being a pseudo-liquid fuel, in arranging for its combustion one has to provide for the 20 to 25 per cent. of solid carbon which it contains, and which is deposited in the furnace as a kind of coke or breeze on the distillation of the volatile portions, which are much more easily consumed than the tar coke. The tar fire I have adopted is one that can readily be adapted to an ordinary coke furnace, and be as readily removed, leaving the furnace as before. The accompanying sketch shows the arrangement. An iron frame *D*, standing on legs on the floor just in front of the furnace door, carries three fire-tiles on iron bearers. The top one, *A*, is not moved, and serves to shield the upper face of the tile *B* from the fierce heat radiated from the furnace,



and also causes the air that rushes into the furnace between the tiles *A* and *B* to travel over the upper face of the tile *B*, on which the tar flows, thereby keeping it cool and preventing the tar from bursting into flame until it reaches the edge of the tile *B*, over the whole edge of which it is made to run fairly well by a distributing arrangement. A rapid combustion takes place here; but some unconsumed tar falls on to the bed below. About one-third of the grate area is filled up by a fire-tile, and on this the tar coke falls. The tile *C* is moved away from time to time, and the tar coke that accumulates in front of it is pushed back on to the fire-bars *E* at the back of the furnace, to be there consumed. Air is thus admitted, by three narrow slot-like openings, to the front of the furnace between the tiles *A*, *B*, and *C*, and under *C* and through the fire-bars *E*. The air openings below are about three times the area of the openings in the front of the furnace; but as the openings between the fire-bars and the tiles are always more or less covered by tar coke, it is impossible to say what the effective openings are. The disposition above described is found to work admirably, and requires but little attention. Three minutes per hour per fire seems to be the average; and the labor is of a very light kind, consisting of clearing the passages between the tiles, and occasionally pushing back the coke on to the fire-bars. These latter are not interfered with, and will not require cleaning unless any bricks in the furnace have been melted, when a bed of slag will be found on them.

The amount of draught required for these fires is very small, and less than with coke firing. I find that 0.08 inch vacuum is sufficient with tar fires, and 0.25 inch for coke fires. The fires would require less attention with more draught and larger tar supply, as the apertures do not so easily close with a sharp draught, and the tar is better carried into the furnace. A regular feed of tar is, of course, required; and considerable difficulty seems to have been experienced in obtaining this. So long as we employed ordinary forms of taps or valves, so long (even with filtration), did I experience diffi-

culties with the flow of viscous tar. But on the construction of valves specially designed for the regulation of its flow the difficulty immediately disappeared, and there is no longer the slightest trouble on this account. The labor connected with the feeding of furnaces with coke and cleaning fires from clinker is of a very arduous and heavy nature. Eight coke fires are normally considered to be work for one man; a lad could work sixteen of these tar fires.

Considerable attention has been paid to the composition of the furnace gases from the tar fires. The slightest deficiency in the air supply of course results in the immediate production of smoke; so that the damper must be set to provide always a sufficient air supply. Under these circumstances of damper, the following analyses have been obtained:

Analyses of Combustion Gases from Tar Fires.

No smoke.

	CO_2.	O.	CO.
	11.7	5.0	Not determined.
	13.3	3.7	"
	10.8	5.4	"
	14.8	2.5	"
	13.5	3.0	"
	12.4	5.6	"
	12.4	4.6	"
	13.1	5.9	"
	15.3	1.0	"
	10.8	4.0	"
	14.0	2.8	"
Average (11 analyses)..	12.9	3.9	
	11.5	Not determined.	
	14.3	"	
	14.6	"	

Damper adjusted so that a slight smoke was observable in the combustion gases.

	CO_2.	O.	CO.
	17.30	None	Not determined.
	16.60	None	"
	16.50	0.1	"
	15.80	0.1	"
	16.20	1.8	0.7
Average	16.48	0.4	0.7

The Destruction of a Philadelphia (Pa.) Theater Traced to an Incandescent Lamp.

The *Exchange and Review* says that while theater fires were few in 1886, a notable instance of that sort accounts for a big blaze in Philadelphia, the last week of the year. At 11 A.M., Dec. 27th, while a moderate northwest breeze was blowing, fire broke out in the Temple Theater and Museum (the latter having wax-work figures, occupying four stories), fronting on Chestnut street, above Seventh, and in four hours totally destroyed the structure and contents—building recently elegantly refitted—besides most of the stock of five large stores located on first floor, and causing much damage to roofs and upper stories of the adjoining Washington Hotel and buildings on Seventh street. Two firemen lost their lives by the falling of brickwork, and others were badly injured. Losses were sustained by thirteen different interests, aggregating $208,000 of loss, in addition to the value of the building, a brown stone structure which had been erected as a Masonic hall.

Most of the losers were fully or fairly insured, except Mr. Singerly, owner of building and ground (purchase price $400,000), and Mr. Brotherton, lessee of the theater and museum. The former considers that increased value of ground since purchase will diminish loss to about $50,000 over his insurance. The latter had only $8,000 insurance, and $50,000 loss. Mr. Singerly's insurances aggregated $97,375 in forty-nine companies, in amounts respectively from $500 to $10,000.

The fire commenced in the rear of the basement on Jayne street, among colored muslin drapery (as is supposed) of a booth in the Chamber of Horrors. It was quite slight at first, and was noticed in the drapery by a few persons, who made efforts to extinguish it, among other trials bringing a hose attached to a pump in the engine room, but the hose proved to be too short. For awhile it was believed that the fire was put out, and thus twelve minutes were lost, during which it crept to the wooden sheathing of an elevator well and ascended then quickly, finding in every story most combustible material in the numerous wax figures and their surroundings, reached the roof, and soon enveloped the whole interior. It is asserted by some that had the ignited drapery been pulled quickly down the incipient fire might have been extinguished. The prevalent opinion of those present at the ignition was that the drapery took fire from an incandescent pendant electric lamp in the booth. The ignition might have happened from improper location of electric wires, or the occurrence of short circuit between two of such wires.

At the coroner's inquest (Jan. 11) testimony was taken as to the origin of this fire. Manager Brotherton thought an incandescent lamp fired the muslin curtain in front of a booth, but said the curtain was two feet from the lamp. The electrician who put in wires said they were not near the drapery. He was asked if he had not heard of a workman's coat having a hole burned in it through being hung on such a lamp, a year earlier, in the same building. He answered, he knew, but had forgotten it. One of the assistants said the flames at first covered a space of about 18 inches only of the drapery, but they got between the canvas top of the booth and the ceiling, and *then* spread rapidly.

A number of incandescent lamps and their wires had been introduced into the Coroner's office, and Inspector McDevitt, of the Insurance Patrol, illustrated how ignition could have happened if a fusible "safety" wire did not act when there was sudden excess of current. Attention was here called to the fact that the white smoke from burning insulating covering looked exactly like steam. The Inspector covered the glass globe of an incandescent lamp with several folds of a cotton handkerchief tied tightly around it, and in ten minutes after the current was turned on the handkerchief commenced to smoulder, and when blown upon by the breath broke into a blaze. As to the wiring, possible excess of current, and surroundings of the booth, Augustus Harmoning, an usher, who was explaining to visitors the figures in the Chamber of Horrors when the fire broke out, testified that a lady standing in front of the booth directed his attention to what she called smoke in the booth. He got into the booth, *saw no flame*, and a moment later one of the incandescent lamps burst. Immediately the canvas top and side caught fire. Witness had extinguished the gas in the basement ten minutes before. He thought he saw a sheet of flame run along the electric light wire inside the canvas after the globe exploded. He was not absolutely certain that the flame followed the wires, but it did move in a straight line.

Some of the wires in the building were found after the fire which had not been soldered at joints. Wm. T. Connor, an electrician employed in the establishment, stated that a steam pump used for hydraulic purposes was under the Chamber of Horrors, so contributing moisture to the atmosphere, and to deflections of the electric current. The testimony closed, but the jury had not agreed upon a verdict as we make this noting, and further testimony is promised.

For our* own satisfaction we made some trials respecting the normal heat of incandescent electric light bulbs, and the augmentation of such heat by impeding radiation. A Fahrenheit thermometer held with its bare bulb against the *side* of the glass enclosure of a 16-candle incandescent lamp where the carbon filament was three-quarters of an inch from the glass, rose to 161° in *ten* minutes. The thermometer bulb being then held to the *bottom* of the enclosing glass, where the filament was within one-quarter of an inch of the surface, the mercury marked 186° in *ten* minutes. A white cotton handkerchief, in four folds, was tied tightly around the glass enclosure of the same lamp, and in *six* minutes it smoked much, and blazed in *eight* minutes, as soon as blown upon. The moment the flame came the glass broke and the light went out. This, of course, does not represent the temperature of the glass enclosure as exposed to the air, nor does it evidence any possibility of ignition should any light, combustible material come in contact with such lamp.

[Since the above article appeared in print the coroner's jury engaged in investigating the origin of the fire made their presentment, on the afternoon of January 17th. They said:

"We, the coroner's jury on inquest, find that John Gibson, aged 31 years, residing at 2,026 Sansom street, and John Johnson, aged 38 years, residing at 616 South Ninth street, members of the Philadelphia Paid Fire Department, were killed by the falling on them of a wall at the Temple Theater, December 27, 1886, in the discharge of their duty at the fire which destroyed the Temple Theater and Musée on said date. We further find that there was no evidence of other cause of fire save electricity; that the fire was not due to incendiarism; that without proper workmanship, care and conditions, it is possible to cause fire by means of incandescent light circuits of low potential in many ways.

"The jury are under the greatest possible obligation to Inspector Wm. McDevitt, of the Insurance Patrol, for his skillful experiments, proving conclusively: 1st, That incandescent lamps will set fire to inflammable substances when the heat in them is confined and allowed to accumulate, and that the lamp need not break in order to do this.

"2d, That the breaking of an incandescent lamp will set fire to inflammable gases.

"3d, That the breaking of incandescent lamps does not ordinarily set fire to solids, even if quite inflammable.

* The proprietors of the *Exchange and Review*.

"4th, That water or moistened wood will 'short circuit' incandescent circuits, and cause fire in so doing.

"5th, That loose joints unsoldered are dangerous and liable to cause fires.

"6th, That the wearing away of insulation on twisted flexible leaders will cause fire, unless safety plugs are used.

"7th, That a careful system of safety plugs for all parts of a circuit, that thorough insulation of all parts of a circuit, that soldered joints and care not to place lamps so that heat can accumalate, are first requisites in a safe system of incandescent lighting.

"And we further find:

"The wiring, adjacent to inflammable canvas and curtains in the Temple Theater, was found to be so imperfectly done as to be dangerous.

"The origin of the fire in the Musée department of the Temple Theater was the incandescent light circuit.

"While we think it our duty to state the possible causes of fires by means of electric light circuits, we believe the risk of fire to be controllable and a minimum in the case of thorough workmanship by reliable companies."]

Pittsburgh, Pa., as Seen by an Englishman.

Engineering lately found space in its columns for the following interesting descriptive article concerning Pennsylvania's industrial hive:

The two great factors in the commercial prosperity of a district are the character of the inhabitants and the natural advantages of the locality. Given a skillful and enterprising race, living in a country well situated either for trading or manufacture, it is certain that they will accumulate wealth. Now, both these conditions are found in no ordinary degree at Pittsburgh. The inhabitants belong to the shrewdest and most pushing race on the globe, and have the advantage of the accumulated skill of several generations, and of the reputation which always attends success. They are located in the middle of a rich mineral region, which not only teems with coal and iron, but also spouts forth oil and gas and salt in a way which renders it one of the wonders of the world. It is covered with splendid forests, and is watered with majestic rivers, which provide it with power and means of transport. With such surroundings it needs no labored explanation to account for the rise of Pittsburgh, and no prophetic insight to foretell that a great future awaits it. It is the heir of wealth which will last for many generations, and the extent of which cannot be computed. Originally the coal and iron of the district seemed sufficient to provide for an enormous population; then the oil was discovered, and burst forth with a furious copiousness which unsettled the public mind, and gave rise to a tide of speculation which overran the entire country; finally, as if nature could put no bounds to her benevolence, it was found that the earth contained an immense store of combustible gas available as a universal source of light and heat, and ready to be employed for melting iron, heating forgings, generating steam, for warming, cooking, lighting, and all the purposes to which coal has hitherto been applied. What the future contains for Pittsburgh no one can tell, but for the sake of our descendants, for those on whom it will fall in years to come—when improved means of communication have practically reduced the dimensions of the globe, and the great Western States of America no longer offer a continually widening market—to maintain the commercial status of the British Empire, it is devoutly to be wished that the last surprise has been evolved from this Pandora's box, and that for the future Western Pennsylvania may be content with the advantages it already enjoys.

The resources of Pittsburgh and the vicinity are so numerous that it would take columns to describe them at length, and we must, therefore, content ourselves with a brief summary. We will commence with the geographical situation. The city is due west of Philadelphia, and almost west of New York, from both of which cities it is distant between 300 and 400 miles. But although comparatively so near to the Atlantic, it is yet in the Mississippi watershed, lying at the confluence of the Allegheny and Monongahela rivers, which fall into the Ohio. This latter connects with the Mississippi, and the two provide access to a million square miles of country, and through the Gulf of Mexico to the South American continent. Although 2,000 miles inland, measured along the waterway, Pittsburgh is a port, and at certain times in the year, when the rivers are full, can be reached by vessels drawing 20 feet of water. But although the mountains prevent direct water carriage between Western Pennsylvania and the Atlantic, the great lake system, which is but 150 miles distant, presents an outlet both eastwards and westwards. The railway facilities rival those offered by the rivers. The Pennsylvania Railroad, the Pittsburgh and Erie, the Pittsburgh Division of the Baltimore and Ohio, and Allegheny Valley, the Pittsburgh, Fort Wayne and Chicago, the Pittsburgh and Cleveland, and the Pittsburgh, Cincinnati and St. Louis Railways, besides others, all aid in carrying material and manufactures to and from Pittsburgh. The competition of these lines is a guarantee of moderate rates, while the number marks Pittsburgh as a distributing as well as a producing center.

The city is situated in the heart of the bituminous coal formation of the Appalachian field, an area of supply which is estimated at 15,000 square miles. It does a large coal trade with the States, to which access is had by the Ohio, the mode of transport being peculiar, and being technically known as "towing." The method employed is, however, far from what would be expected from the name. Ten to fourteen barges, coal boats and flats, and one to four boats filled with bunker coal for the trip, are securely lashed together and placed in front of the so-called tow-boat, with the exception of two, which are ranged alongside of it. This floating island, carrying 24,000 tons of coal, is propelled and guided by the tow-boat down the Ohio, and often as far south as New Orleans, going with the flood current, which runs from eight to ten miles an hour, sweeping round the bends, past the bridges, and through the narrow channels until it reaches its destination. In the season eight or ten of these cargoes will leave Pittsburgh in a day. The coal comes almost entirely from the collieries in the pools of the Monongahela river. There are about sixty-six firms at work getting coal on the river, their combined output being about 100,000,000 bushels per annum, or 4,000,000 tons. On the Pittsburgh, Cincinnati and St. Louis Railway, and Chartiers branch, there are sixteen collieries; on the Baltimore and Ohio Railroad, and on the Youghiogheny river, fourteen collieries; on the Pennsylvania Railroad, six collieries; on the Allegheny river, six; and in and around the city of Pittsburgh, eight collieries. Besides there are a number of mines not yet fully developed. Coke is made in the Connellsville field, which is near Pittsburgh, and measures 60 miles by 3 miles. Here is a bed of coal from which there is produced a coke famous all over the States, 4,000,000 tons of it being consumed annually. There are engaged in the manufacture 10,788 ovens.

But it is not so much with coal as iron that the name of Pittsburgh is associated. Throughout the counties embraced in the bituminous coal region there are to be found extensive beds of iron ore, and there are equally large deposits in the counties east of and lying along the bases of the Allegheny Mountains. The irons of the celebrated Juniata region are close to Pittsburgh, while to the west there are those of Eastern Ohio. The rich ores of Virginia will be accessible on the completion of the Pittsburgh, Virginia and Charlestown Railroad, while the ores and iron of Lake Superior and the Missouri can be brought by water carriage. A blast furnace was erected in Pittsburgh in 1792, but had a career of only two years. It was not until 1859 that the second furnace was built, but since that date eighteen others have been erected, varying in height from 62 feet to 87 feet. There are also five furnaces in the neighborhood, the aggregate annual output of the whole being 922,000 tons. Besides these there are thirty-five iron rolling mills, employing over 18,000 hands, and occupying 138 acres of land. They work up 670,000 tons of metal per annum into merchant bar, hoop, boiler plates, pipes, nails and rods. Steel is also made in large quantities, and has a high reputation. Exclusive of Bessemer plants, and rail mills, and steel casting works, there are twenty-three steel works, of which eight are strictly devoted to crucible tool steel. In the Bessemer trade there are three 10-ton converters, three 7-tons, three 5-tons, and two 2-ton converters, and these, it must be remembered, are much harder pushed in good times in America than in this country, owing to the system on which royalties are paid. In 1885 the output was over 300,000 tons.

But the crowning glory of Pittsburgh is its natural gas. Other lands have abundant coal and inexhaustible ore, but nowhere else are these associated with a vapor fuel which flows freely from the earth, and can be used without preparation, and apparently without stint. Its use has perfectly revolutionized the city, and has converted one of the grimiest places in the world into a comparatively clean town. The economies it realizes are difficult to learn, but in one steel plant it has been found that $40,000 worth of gas did the work of $96,000 worth of coal, with an attendant saving of $12,000 in the transport of ashes, and of 25 per cent. in wear of the furnace. At a glass factory the gas has reduced the fuel expense by $6,000 a year. At an iron works with nineteen heating furnaces, the saving is put down as $6,500 in fuel, $2,600 in transportation, and $4,100 in repairs. The saving due to reduced oxidation is also great. The general opinion is that the saving in fuel cost is possibly 50 per cent., and the increased yield 15 to 25 per cent. There is also a distinct gain in quality of the metal, due to the absence of sulphur, and the terms "gas iron" and "coal iron" are beginning to appear in the market. The gas district appears to lie entirely within 30 to 40 miles of Pittsburgh, and the greater part of the wells are within 20 miles. The supply shows no signs of exhaustion. In the Murraysville district, which may be likened to a pepper bottle, so thick are the wells, a shaft sunk by the People's Company, in December, 1885—ten years after the first Murraysville well—exhibited the strongest flow ever seen in the district; and the original Murraysville well, although it has been blowing for ten years, is said to be as strong as ever. The gas was first used in Pittsburgh as manufacturing fuel in 1875-6, but its general adoption only dates from July, 1884, a fact which shows that great doubts were felt as to its permanence. At that time Mr. George Westinghouse, Jr., organized the Philadelphia Company

for the supply of gas fuel. At the present time 3,000 families, 34 iron and steel mills, 60 glass factories, and 300 smaller factories and hotels are using the gas. There are laid 336 miles of pipe, of which 66 miles lie within the city. Of this pipe 10 miles are 24 in. in diameter; 7 miles are 20 in.; 6 miles are 16 in.; 11 miles are 18 in.; and 14 miles are 8 in.

Of the minor features of Pittsburgh we cannot write, but those who are interested in them can find much information in "Pittsburg's Progress, Industries, and Resources," by Mr. Geo. H. Thurston, of that place, to whom we acknowledge our indebtedness for many of the facts mentioned above. We do not find, however, that he, or indeed any American author is quite frank in presenting the facts which tell against the credit of this favored city. He admits that it is grimy and black, and that it is exclusively a manufacturing place, devoid of beauty, but he does not tell us that its municipal and sanitary affairs are in a state which would raise a perfect storm of disapprobation in this country. The City Council is practically bankrupt, and all improvement is stopped for want of funds. Some years ago the authorities thought to do great things for the citizens without any additional taxation. They therefore bought land and waited for the rise, hoping to clear a handsome profit. But someone brought the matter before the courts, who decided that it was beyond the competence of the council to speculate in lands, and the lots had to be resold, at a bad time, with the result that now the city is saddled with a debt which consumes much of the rates. The limit of taxation allowed by law has been reached, and the consequence is that the place is without many of the needs of civilized life. There is no main drainage, and the use of cesspools is almost universal. Everyone gets rid of his sewage in the easiest way, and often this ends in the ground becoming thoroughly soaked and poisoned. The paving of the streets is execrable, and is made worse by being constantly broken up to lay the natural gas mains, when there is no effective control to oblige the companies to put it in good order again. We merely point out these facts to show that Pittsburgh is not perfect. We have no doubt that in a few years all these blots will be removed, and its domestic concerns will be put in a condition befitting its manufacturing position. It is no boast for a city to be wealthy, if it is not at the same time clean.

How to Make an Analysis of Sulphate of Ammonia.

Mr. N. H. Humphrys contributed the following interesting communication to the January issue of the *Gas Engineer:*

Having been requested to give an account of the simplest method for analyzing this substance, suitable for gas managers who are not experienced analysts, and have not the resources of a complete laboratory at command, I would first remark that there is no royal road to accurate laboratory work, and that the necessary manipulative skill for the efficient carrying out of even such a simple chemical experiment, as that about to be described, cannot be obtained without a reasonable amount of practice. The tyro who essays to follow these instructions will probably not obtain satisfactory results the first time, but with practice and perseverance he will soon succeed.

Sulphate of ammonia, when quite pure, consists of two equivalents of ammonia (NH_3) combined with one equivalent of sulphuric acid (H_2SO_4), and its formula is usually written thus: $2(NH_4)SO_4$. This description is given in popular language, which plainly sets forth the actual facts; but is not quite in accordance with the latest scientific theories. Since the molecular weight of ammonia is 17, and that of sulphuric acid 98, it follows that the pure salt consists of 34 parts by weight of the former, combined with 98 of the latter; or reducing these proportions to percentages, we have in every 100 parts of sulphate 25.76 parts of ammonia, and 74.24 of sulphuric acid.

The process about to be described is based on the fact that, if a solution of ammonia sulphate is boiled with a fixed alkali, the ammonia is displaced, passes off with the steam, and may be collected in a condenser, or absorbed by acid. The apparatus required will be a retort stand and Bunsen burner, a 16-oz. flask, fitted with a sound cork, having two tubes passing through it. One of these tubes, which is long enough to reach nearly to the bottom of the flask, consists of a safety thistle-head funnel. The other tube, which passes only a sufficient distance through the cork to reach just into the body of the flask, is bent at right angles, a few inches above the cork, so as to follow a horizontal direction. The other end of it is again bent at right angles, so as to show downwards, and is connected, by means of a short piece of india rubber tubing, to a perpendicular tube of similar size, passing through a cork fitted in one of the necks of a three-necked Woulfe's bottle, and extending nearly to the bottom of the same. It should be noticed that the piece of india rubber tubing must only serve the purpose of a connecting piece. The ends of the tubes respectively must be cut off smoothly and rubbed down, so that they may touch and fix close together. If the hot vapors actually came in contact with the rubber tube they would soon soften it. One of the necks is closed by a plain cork, and the third has a cork bored to take the stem of a chloride of calcium tube, which is filled with small pieces of broken glass. This apparatus will be supplied by any philosophical instrument maker, or can be readily made up from the instructions given in chemical handbooks.

The solution of sulphate to be tested is put into the distilling flask together with an excess of soda, and boiled. Steam and vapor of ammonia pass over into the Woulfe's bottle, and bubble through a solution of acid, the bottle having been charged with the same to a height sufficient to cover the end of the tube connected with the eduction tube from the distilling flask. Here the ammonia is absorbed, but to make sure that no ammonia is lost, the glass in the chloride of calcium tube has been moistened with acid, and therefore acts as a miniature scrubber.

We shall also require a set of two burettes, graduated to show 100 septems in 500 divisions, mounted on proper stands, as supplied with the same, two one-pint beakers, two pipettes to deliver respectively 100 and 50 septems, and glass stirring rods. Also a set of balances and weights. The chemicals will be solutions of soda, and of sulphuric acid, accurately prepared so as to contain in 1,000 septems ($\frac{1}{10}$ gallon) five times the atomic weight in grains. These are known as 5° solutions, and had better be obtained from the philosophical instrument maker, ready made. They will respectively contain $5 \times \frac{49}{2} = 245$ grains of sulphuric acid, and $5 \times 23 = 115$ grains of soda, per deci-gallon, or 0.245 grain, and 0.115 grain per septem; and they will exactly neutralize equal volumes of each other. A 5.0 solution of ammonia may also be provided, and this will contain $4 \times 17 = 85$ grains pure ammonia per deci-gallon, or 0.085 grain per septem. And lastly some tincture of litmus, of the best quality, will be required.

We are now ready to commence operations. Take a fair sample from the sulphate heap, which will best be secured by carefully mixing portions taken from all parts with a shovel. It must be remembered that the outside and upper portions will be drier than the interior and the bottom of the heap. A portion of about one ounce in weight should be transferred to a stoppered bottle and taken to the testing room. Carefully weigh out 50 grains, and dissolve it in about 2 ounces of distilled water. With regard to the latter, care must be taken that it is pure. The importance of using perfectly pure water in all analytical operations is such, that if it is intended to carry on a series of experiments, the best plan is to purchase a small still and condensing worm, which can be heated by a gas boiling burner, and prepare the same in the testing room. One or two gallons can be made at a time and stored in stoppered bottles. Another 50 grains of the sulphate may be weighed out and placed in a drying oven, carefully maintained at a temperature of 212°, for a few hours. The loss of weight will show the moisture present.

The apparatus having been built up as above described, a sufficient quantity of water is poured into the Woulfe's bottle. A small portion is also put into the distilling flask and caused to boil. This precaution will enable any leakage or faulty places in the corks to be ascertained, and also, by moistening the cork in the distilling flask, cause it to swell and become quite sound and tight. An excess of the standard sulphuric acid is then poured into the Woulfe's bottle, through the chloride of calcium tube, so as to leave the glass in the latter moistened with the acid. The quantity of acid that constitutes an excess may be arrived at as follows: We have seen that each septem of the acid is capable of neutralizing one septem of ammonia solution of equal strength, and it is therefore equivalent to 0.085 grain, or say, $\frac{1}{12}$ grain of ammonia. The 50 grains of sulphate will contain not more than 13 grains ammonia, and the quantity of acid required to neutralize this would be 156 septems. But as a decided excess must be used it will be best to put 200 septems in the Woulfe's bottle. This having been done, the solution containing the 50 grains of sulphate can be poured down the thistle-head funnel into the distilling flask (the gas burner having first been either extinguished or removed to avoid risk of cracking the flask). A quantity of standard soda solution, equal to the standard acid—viz., 200 septems—is also poured down, and a little distilled water is finally added to wash out the funnel. The liquid is then caused to boil slowly until about 3 ounces of water has distilled over into the Woulfe's bottle, which will occupy about an hour.

The apparatus is then disconnected, and the contents of the flask, and of the Woulfe's bottle, respectively poured out into separate beakers, the vessels being thoroughly rinsed out with distilled water, so as to be sure that the whole of the liquid is transferred to the beakers, the rinsings being, of course, added to the previous contents. Care must be taken to wash out the chloride of calcium tube so as to remove every trace of acid from it, the washing being added to the other contents of the bottle.

Taking the solution from the Woulfe's bottle first, we have here 200 septems of acid, partly neutralized by the ammonia contained in the sulphate. We know that the original 200 septems would require a similar quantity of either the soda or the ammonia solutions to neutralize it. If we now add the quantity of either of these alkalies that is necessary to produce that effect, the difference between the quantity required and 200 will give the quantity of acid neutralized by the ammonia distilled over. Accordingly the solution from the Woulfe's bottle is colored a distinct but faint red by the addition of a few drops (as little as possible) of the litmus tincture. One of the burettes is then filled with an alkaline solution, the ammonia being preferable. By

cautiously opening the pinchcock at the bottom the liquid is allowed to run out into a waste vessel until the surface stands exactly at the 100 septem mark. After waiting a minute or two to allow any liquid adhering to the sides of the tube to run down, the beaker is put beneath the burette, and the alkaline solution dropped in very cautiously until a purple tint appears. If an excess of alkali is added the liquid becomes a decided blue. Great care must be exercised to secure the exact point of neutralization—*i. e.*, when the liquid is neither red nor blue, but half way between, and if too much alkali is added it can be "brought back" by the addition of acid from the alkali burette, the quantity of acid used being carefully noted, and added to that already known to be present in the liquid. Suppose that 55.8 septems of the alkali are found to be required to produce this exact shade of neutralization. Call this *a*.

We now turn to the contents of the distilling flask. This originally consisted of 50 grains of sulphate, and 200 septems soda solution; but the ammonia of the former has been displaced, and the soda has taken its place. A quantity of soda corresponding to the acid in the sulphate has been neutralized, and this can be estimated by charging the other burette with the standard acid, and proceeding as above described. The only difference will be that the liquid will be blue instead of red, when tinged with the tincture of litmus. If the experiment has been accurately conducted, and the sulphate operated upon is neutral, the quantity of acid required should be the same as required by *a*. Let us call this *b*.

Sometimes, when the strength of the acid solution used in the manufacture of the sulphate is too high, the salt will give a distinctly acid reaction. Therefore, it it is found that *b* is higher than *a*, the 50 grains weighed out for drying may be dissolved in distilled water, and tested with blue litmus, which will be turned red if an excess of acid is present. If there is a decided excess of acid the solution can be colored with tincture of litmus, and titrated with the ammonia solution, in a manner similar to the acid solution in *a*, when the excess of acid can easily be defined. If the sulphate is found to be neutral, then it is probable that one of the solutions is incorrect, probably the ammonia, which is apt to lose strength by keeping. It is needless to add that all the solutions should be as fresh as possible, although if stored in a cool place, and in stoppered bottles of the best quality, they will keep for several months without alteration. When they are used care should be taken to return the stopper to the bottle as soon as possible; they should not be left open for any length of time.

We have now to make the calculation, which is a very simple one. We have seen from *a* that the ammonia present in the 50 grains of the sulphate was sufficient to neutralize 200—55.8 = 144.2 septems of 5.0 acid; and from *b* that the acid in the sulphate was equivalent to 200 – 55.8 = 144.2 septems of 5.0 alkali. Also that a 5.0 solution of sulphuric acid contains 0.245 grains of the pure acid per septem, and an ammonia solution of similar strength contains 0.085 grains of pure ammonia. Therefore

$144.2 \times 0.085 = 12{,}257$ grs.. or 24.514 per cent. of ammonia.
$144.2 \times 0.245 = 35.329$ grs., or 70.658 per cent. of sulphuric acid.

47.586 96.172 per cent.

So there is a residue of 4.828 per cent., which will be found to consist chiefly of moisture, and will also include dirt, dust, and accidental impurities.

An Ingenious Automatic Fire Kindling Device.

On the afternoon of Monday, Jan. 10, Mr. T. W. Campbell, of Vicksburg, Miss., made a public test in the city of New Orleans, La., of what he terms "an automatic heater and fire lighter," which device is, the invention of his brother, Mr. Lowden Campbell, of Alexandria, Va. The trial was made in the engine house of Volunteer Steam Fire Company No. 1, located on Hunter street, and the result answered in every way the claims of the exhibitor. Our report of the affair is rather incomplete, owing to our informant having neglected to furnish dimensions of pipe, quantity of gas consumed, etc.; but perhaps the following will furnish a measurably understandable description of the device and its operation.

The contrivance is so arranged that by means of a gas pipe inserted through the ordinary fire door of the engine a degree of heat sufficient to keep the standing water in the boilers at a fair warmth is maintained. A gas lamp or burner equipped with a stopcock, from which project two arms like two spokes of a wheel, is fastened to the floor. A small bar is screwed to the bottom of the boiler, and as the engine passes over the lamp the bar strikes one of the spokes and turns on the gas. A jet of flame about a foot in height spurts upward, and as the boiler of the engine passes over the flame the fuel in the fire-box, previously saturated with inflammable oil—in his test Mr. Campbell used coke saturated with kerosene—takes fire. A second bar on the rear part of the boiler strikes the second of the aforementioned spokes, which latter is raised by the depression of the first, and the gas supply is cut off. The gas pipe, previously spoken of as being inserted under the boiler to keep the water warm while the engine awaited the signal of the firemen, drops out as the engine moves forward, and, by its weight, drops to the floor and cuts off the gas in the socket or elbow. Our informant, who was present at the trial test, says that the device is very ingenious and exceedingly simple. He is of the opinion that in its use much valuable time can be gained, as the steam fire engine so arranged in its house could raise sufficient steam, within 1½ minutes from the time of starting to a fire from its resting place, to force water through the hose. The apparatus has other merits—cheapness and ease of application.

SPECIAL ENGLISH CORRESPONDENCE.

Communicated By Norton H. Humphrys.

Salisbury, Jan. 10, 1887.

Gas as a Domestic Servant.—Smokeless Fires.—Mr. Lewis T. Wright on "Liquid Fuel."—Annual Reviews.—Young's Ammonia Purification Process.

Some interesting information as to the uses of gas for heating and cooking has recently appeared in the pages of a Glasgow paper. Here is an eloquent description from the user of a gas fire for three years. "This morning is very cold; flakes of snow are flying; the roofs of the houses are white with hoar frost, and here am I, at 7 A.M., seated in my room, 12 feet by 13 feet, in a warm, comfortable atmosphere. I put a light to my fire when I got out of bed ten minutes ago, and the room is already in a habitable state. No breaking of sticks, no carrying of coal, no raking out of ashes, no raising of dust, no dirtying of the room—only the application of a match and all is serene. The fire burns for an hour, my specified time for writing in the morning, and the cost is about three-fourths of a cent. When 8 o'clock strikes I turn off the gas and go to breakfast. I leave my warm room in the state in which I found it—free from dust, free from a dying-out fire and its attendant ashes and cleaning up. When I turn off the gas the expense ceases, and without the gas my hour's work in the morning would be lost." This letter is an excellent testimonial as to the uses of a gas fire for business men, many of whom find it convenient to have a small sanctum or study at home for letter writing, etc. The hour before breakfast in the morning is of great importance to many, and the convenience of the gas fire in the study is such as to far outweigh any consideration as to cost of gas. In my own library a gas fire is fitted up, also a Chubb's lock on the door. The gas fire dispenses with the almost daily visit for dusting, and that is almost indispensable when a coal fire is used, besides the lighting of the fire, bringing in coals, etc. I light the gas fire, when necessary, when coming in, and turn it out on leaving, take the key with me and go away, leaving desks, drawers, etc., open, papers and books laying about all ready for use, knowing that they are quite safe from the investigating fingers of my wi—of the servants and children, I mean.

Another correspondent gives the results of a year's working without coal, using gas for heating and cooking purposes. As a result he was able to economize in the item of domestic help, and he estimated the saving by using gas stoves at no less than $100 per annum. The great disadvantage in the introduction of gas stoves into houses is that they usually have to be adapted to flues originally designed for coal fires, and, therefore, unsuitable for them. It would be interesting to know the results of using gas for all household purposes, by means of appliances fitted with flues designed specially for the stoves, so as to secure sufficient ventilation with the least possible loss of heat. One of the chief difficulties in the way of the introduction of gas stoves is the fact that the chimney is usually the only means of ventilation, and when this is practically blocked with a view of adjusting the draught to the requirements of the stove the lack of ventillation becomes apparent, and the stuffy atmosphere is said to be due to the gas.

The chimney sweep is by no means a desirable visitor in the domestic circle. The work of sweeping the chimney and removing the soot entails a vast amount of preparatory moving about and subsequent cleaning up. I have heard of one instance in which a sweep caused great consternation. A party of sporting gentlemen were sitting up late on a Sunday evening, playing cards, and continued their play until nearly daylight. The sweep had been told to call very early on Monday, and accordingly proceeded to the house. Seeing a bright light in the parlors, and a French window left open, his "sooty majesty" concluded that the servant had already prepared for him, and going up to the window called out, "Are you ready for me?" The sight of his black face was enough for the obfuscated gamblers, who fled in all directions. In any case, the periodical visits of the sweep cause so much dirt and trouble that most people would be glad, like Prof. Frankland, to go for five years without having a chimney swept in the house. The Professor has accomplished this by very simple means. No new grates or stoves have been put in, the ordinary grates fitted in when the house was built being still in use. The only alteration, or rather addition, was a movable blower, costing about 50 cents, for each grate; and gas coke was ordered to be used instead of coal. The use of the blower enables the fire to be lighted in the

ordinary way. Prof. Frankland frightens the London people now and then by telling them of the awful things, with long Latin names, that exist in the water they drink, and he has now rendered them a most important service by showing that a sure cure for the smoke nuisance, which has become so very prominent in London, is available to every householder, without trouble and without expense.

Mr. Lewis T. Wright, the General Manager of the Nottingham Corporation Gas Department, has contributed to the proceedings of the Society of Chemical Industry an important paper on "Liquid Fuel."* It comprises an account of some experiments on heating boilers with tar, coal, coke, and creosote respectively. While with coal only about 70 per cent. of the theoretical heating value was realized in practice, 80 per cent. was obtained from the coke, and 84½ per cent. from the tar. Mr. Wright gives the composition of his tar as 80 per cent. carbon, 7 per cent. hydrogen, and the remainder consists chiefly of oxygen. It must be remembered that the constitution of tar varies according to the manner in which it is prepared. I have often heard tar distillers say that the tar from small works is much the best for their purposes. The fact is, that as a rule the small works cannot run such high distilling temperatures and short charges as the large ones, and consequently the tar, being produced at a lower temperature, is much richer as regards the lighter oils, and these contribute principally the hydrogen that is present. The practical heating value of hydrogen is some three times greater than that of carbon, and consequently even a very small difference in the quantity of hydrogen present will have a considerable influence on the heating value of the tar. But the most interesting feature of Mr. Wright's paper (to gas engineers) is a new design for a retort house tar furnace which evidently produces excellent results, and is a great improvement on the methods of tar burning now in use. Both the tar and the air supply are distributed without the use of steam so effectively that the furnace works without producing smoke, even when the air supply is reduced to nearly the theoretical quantity, in this respect comparing favorably with the best gas furnaces. The arrangement can be readily adapted to any ordinary coke fire, and taken away again if desired. Indeed this could be done without letting down the heats. Mr. Wright's arrangement is one of the most important improvements which the modern reign of tar burning has had the effect of bringing out.

At this season of the year all the technical magazines have as an important feature a review of the year now closed, together with some anticipations as to that which has just dawned upon us. The general tone, with respect to the gas industry, is one of great satisfaction. Perhaps rather too much importance is attached to the decline in the price of tar and ammonia, which is not altogether an unmixed evil. It would be very pleasant to have a regular demand for tar at 45s. per ton, and sulphate at £20, but it is hopeless to expect such. Even if the market was firm at such prices for a time, it would soon be upset by large supplies from coke ovens, blast furnaces, and works specially erected for the utilization of colliery waste, etc. I would rather see the gas industry standing on its own bottom than bolstered up by large receipts for residuals. As regards the main points, such as the prices of materials, and the demand for gas, both have been satisfactory. Coal and iron have been obtainable at moderate prices, and if the consumption of gas has not increased to the extent that has been experienced in previous years, it certainly has not gone back. It is worth while to notice the significant fact that gas securities of all kinds have improved in value during the year. Notwithstanding the high prices at which they stood at the end of 1885, their value was still higher at the end of 1886.

Mr. William Young, of Clippens, has just patented a process for the complete purification of coal gas by means of ammonia obtained from the ammoniacal liquor. He proposes to bring the crude gas in contact with caustic ammonia solution, the said solution being obtained by submitting ordinary liquor to a temperature under 212°, by which the impurities are driven off, leaving the ammonia behind. The most important feature is the conducting of this dissociating process at a pressure of 50 lbs. per square inch or so. Mr. Young has discovered that these conditions of pressure do not interfere with the dissociation, nor do they materially increase the solubility of the acid gases; but the solvent power of the water on the ammonia is greatly enhanced. Consequently much stronger liquors can be treated by this process than could possibly be done by those previously known, which treat the liquor at atmospheric pressure. Hitherto the usual plan has been to cause the ammonia solution to travel in the opposite direction to the gas. He describes a simple arrangement for carrying out his invention, consisting essentially of a dissociating vessel, a concentrating still, an ammonia scrubber, and a water scrubber. The first two consist of cylindrical towers, and the scrubbers are narrow rectangular vessels containing a number of troughs superimposed one on the other. A boiler for generating steam, and a small engine for working two pumps are required, and the engine may be worked by the gases escaping under pressure from the dissociating tower, thus economizing steam. The office of the pumps is to raise ammoniacal liquor from a reservoir tank at the bottom of the ammonia scrubber to the top of the dissociating tower; and from the base of the still to the top of the ammonia scrubber. The cycle of operations is as follows: Crude ammoniacal liquor from the store well is supplied to the top of the dissociating tower, by means of a connection attached to the pump. After passing down through the specially devised scrubbing arrangement, it accumulates in a reservoir at the base, which is surrounded by a steam jacket. Here it is heated, and the dissociation takes place, the desired degree of pressure being obtained by means of a loaded escape valve. This vessel must, of course, be strong enough to withstand the pressure, and it is fitted to a safety valve. As soon as the liquor is sufficiently caustic it is passed on through an ingeniously devised trap, which prevents loss of steam, to the concentrating still, where it is heated by a current of steam. From this it is caused to pass through a water condenser on the top of the ammonia scrubber, and then into that vessel. As soon as this is properly charged the crude gas may be admitted, and passing repeatedly in contact with the liquor, parts with its carbonic acid and sulphuretted hydrogen. The process is continuous, caustic liquor being supplied to the top of the scrubber, and the spent liquor being drawn off to the dissociating tower, the rate of treatment of the liquor being regulated to keep pace with the quantity of gas to be purified. Several ingenious arrangements in detail enable the whole to be under control. The water scrubber serves to remove any excess of ammonia that may remain with the gas. It is supplied with clean water, and the liquor accumulating in it is either treated for the recovery of the ammonia it contains, or passed on to the dissociating tower. I hope to refer further to this ingenious and carefully worked out system of apparatus on a future occasion.

*Ante, p. 67.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Annual Election.—At the annual meeting of the stockholders of the Whitehall (N. Y.) Gas Light Company Mr. F. A. Sabbaton, of Troy, N. Y., was elected President; W. F. Bascom, Treasurer; and H. A. Brooks, Secretary.

Election of Trustees.—At a meeting of the stockholders of the Consolidated Gas Company, of this city, held Jan. 24, the following-named gentlemen were elected to serve as Trustees for the ensuing year: Gen. Charles Roome and Messrs. T. K. Lees, O. Zol ikoffer, C. G. Francklyn, T. Rutter, H. E. Gawtrey, P. R. Pyne, S. Sloan, J. W. Smith, H. Day, J. P. Huggins, E. S. Higgins, and H. Clausen. From the foregoing it will be seen that no change was made in the Board, the list being identical with that reported after the election of Jan. 25, 1886.

A Waif from Wilmington.—Mr. Thos. Curley, who for so many years has safely piloted the Wilmington (Del.) Gas Company on and over the tides of business, writes us that the new net rate, which became operative on first of year, gives great satisfaction to the gas consumers. Under the new schedule gas is supplied at $1.35 per thousand, and nearly 500 gas stoves of all sorts are in use in the city. Despite the competition with the local electric lighting company, the gas output shows an increase over the quantities sent out prior to the advent of the electricians. The holders of Wilmington gas shares ought to be satisfied with the management of President Richardson and Superintendent Curley, for they receive an annual dividend of 12 per cent., and the stock is worth double the nominal par value. However, the Wilmington gas proprietors own much valuable property that was paid for out of the earnings of the Company, and therefore not represented in the nominal capital. Mr. Curley says (his letter bears date of Jan. 20) his Company is putting in "a small water gas plant (Flannery system) as an auxiliary to our coal gas apparatus." We are glad to be able to say that Mr. Curley has entirely recovered from the illness that beset him about a month ago.

Something from Tyrone, Pa.—At the January meeting of the Tyrone Common Council Mr. C. H. Dieffenbaugh, acting for the Tyrone Gas and Water Company, handed in a proposition to light, extinguish, keep in repair, furnish all gas, gasoline, and oil needed to keep in duty 34 gas and 21 oil or gasoline lamps for the sum of $900 per annum, payable in twelve installments. The lamps are to be lighted "until 12 o'clock of each night in the dark phases of the moon." The proposition was laid over to be discussed at the meeting of Council to be held on the 7th inst. Perhaps by that time the Tyrone gas folks will not be disposed to offer such favorable terms. In the meantime the local electrical promoters have started up their plant—the dynamos were put in motion on New Year's night—and the initial attempt was rather disheartening. Interruptions were frequent, and gloom was the result. Now, however, they have things in somewhat better shape, although it seems needless to add that eccentricities in the supply are far from being in line with "angels' visits." The electricians had counted upon $8,000 as sufficient for their needs; but when all the items were footed up it seems that $14,000 had been invested. On at least three-fifths of that sum they

are paying 6 per cent. per annum, and as the number of lamps now in circuit totals up to 800, and which are furnished at a monthly charge of 50 cents per lamp, it is hard to figure out where the Tyrone electricians can expect to make a dividend in the twelvemonth. There are, however, dividends of various sorts; for instance, that denominated as an "Irish dividend," so called because it requires those interested in an enterprise to draw a check, payable to the managers of the particular enterprise, the proceeds of which are intended to make good a deficit caused by inability of those in charge to make the receipts meet the expenses.

A Line or Two from Bro. Stein.—In a letter from Mr. Edward Stein, of the Siemens-Lungren Company, of Phila., Pa., written in Paris, France, and bearing date of Jan. 9, that astute gentleman says: "Paris very beautifully lighted, and entirely with gas. I am greatly surprised at the small number of arc lights in use in Great Britain and France; and in fact I believe there are a larger number of arc lights on Broadway, say between the Astor House and the Fifth Avenue Hotel, than can be found in all of Great Britain and France. Indeed, if you set out to find an arc electric light in either of these countries you would be obliged to do considerable searching. I have visited a number of manufacturers of gas appliances, and find them all more or less busy in their various lines. Gas companies here seem more active in the matter of introducing appliances than is the case in the States, and I note that great attention is devoted to the question of cooking by gas." Mr. Stein expected to start for home on the 22d of January, presumably by the steamship Aurania, which left Liverpool on that date.

Altoona (Pa.) Has the Electric Light.—And has it with a vengeance, too. The Edison incandescent system of supply was started up in that city sometime in the first week of January, and now another lot of promoters seek to have the Councilmen grant a charter for an opposition, or an independent, electric company. If these latter obtain the desired permission there ought to be lively times in the artificial lighting business of Altoona. If we mistake not the Altoona Gas Company charges a net rate of $1.50 per thousand cubic feet.

An Answer to Several Inquirers.—Those who have written to us in regard to particulars concerning the position now held by Col. W. A. Stedman, are hereby informed that the Colonel is now acting as Secretary and Treasurer of the American Electric Manufacturing Company, and his office is at No. 146 Broadway, this city. He is connected with the Newport (R. I.) Gas Light Company in the capacity of consulting engineer, nominally; but we incline to the idea that he is still and will remain closely identified with the Company that owes so much to his talent and sagacity.

Annual Election, Danvers (Mass.) Gas Company.—At the annual meeting of the Danvers Gas Light Company, held Jan. 13th, Messrs. G. A. Tapley, M. L. Merriam, C. S. Purinton, L. A. Wyman, and W. E. Fette were chosen to compose the board of directors. Mr. Louis Malm was elected Clerk and Treasurer. The directors, at a subsequent meeting for organization, elected Mr. W. Eliot Fette to the dual position of President and Agent of the Company.

No Consolidation Intended.—Some time since rumor asserted that the Boston Brush Electric Light and the Boston Gas Companies were to be combined under the Presidency of Mr. M. S. Greenough, with Mayor Hugh O'Brien as Treasurer, who now holds a similar position in the Boston branch of the Brush Company. The alliance was said to have been completed, but investigation proved that there was no truth in the assertion.

Named as Western Agent.—Mr. C. L. Gerould, of the Nassau Gas Light Company, of Brooklyn, N. Y., informs us that Mr. H. T. Gerould, of Mendota, Ills., will hereafter act as Western agent for the sale of "Gerould's Improved Retort Cement."

Chosen for the Presidency.—Mr. E. S. Atwater has been selected by the stockholders of the Poughkeepsie (N. Y.) Gas Light Company to assume the duties attached to the Presidency of that Company. It will be remembered that Mr. Atwater succeeds the late Mr. E. M. Van Kleeck, whose death was reported in our last issue.

To Extend a Charter.—A bill to extend the charter of the Portland (Me.) Gas Light Company asks that that instrument be extended for a period covering 30 years beyond the period of limitation now fixed by the law. It is probable such consent will be granted.

Annual Election.—At the annual stockholders' meeting of the Capital Gas and Electric Light Company, of Frankfort, Ky., the following officers were elected: President, Gen. D. W. Lindsey; Secretary and Treasurer, E. L. Samuel; Superintendent, S. J. Shea; Directors: Gen. D. W. Lindsey, and Messrs. E. L. Samuel, J. W. Prewitt, P. McDonald, and W. C. Herndon.

Annual Election at Newport.—The board of officers elected for the ensuing year by the stockholders of the Newport (R. I.) Gas Light Company is as follows: President, H. Bull; Secretary, J. H. Cozzens; Treasurer, A. K. Quinn; Supt., W. B. Knight; Directors: H. Bull, J. H. Cozzens, J. A. C. Stacey, P. Rider, J. A. Peckham, Robt. Chace, and W. H. Fludder. As stated above, Col. W. A. Stedman will act in the capacity of consulting engineer for the Company. The directors were authorized to establish an electric lighting plant.

Brother Rollins Still at Work.—The thoroughgoing Agent and Superintendent of the Worcester (Mass.) Gas Light Company intends to amuse himself this summer by following out a varied programme, arranged in something like the following: The Company's Lincoln Square holder (capacity 62,000 cubic feet) is to be rebuilt, and a new or additional holder (calculated for a capacity of 400,000 cubic feet) will be erected at the works. The latter holder will be enclosed by a brick house topped with a slate roof. A new 20-inch main is to be led off from the large holder for a distance of, say, 2,500 feet, and other proposed conduit enlargements and extensions embrace the placing of over two miles of pipe, with diameters ranging between 16 and 4 inches. New covers are to be placed on the purifying boxes (16 ft. by 32 ft.), and new cups are to be fitted in the 24-inch seal. Now, putting these things together, Brother Rollins won't have much leisure to devote to the consumption of "shore dinners," etc., when the season of such festivities comes to hand; but Rollins, being comfortably equipped in the matter of solid avoirdupois, will probably not find himself badly "reduced" even should he omit an occasional outing. Last year the Worcester Company manufactured 85,739,500 cubic feet of gas; the annual sendout was just 10,000 cubic feet less, and the ledgers show that 79,272,500 cubic feet were sold in the twelvemonth. The candle power, as shown by the tests made at the works, averaged 18.4 for the year. The Massachusetts State Gas Commissioners, early in January, notified the Worcester Gas Company that as complaint had been formally made against it by residents of the city, who asserted that the gas supplied them was of poor lighting value, impure in quality, and that an excessive rate was charged, the Company must appear before the Board to answer the accusations, and properly defend itself. The accused retained Messrs. R. M. Morse and Col. G. A. Bullock as counsel, and the hearing was set for January 26th. At present time of writing we have not heard how the case was decided; but we may here briefly cite how the complaint originated. Worcester was recently blessed with an addition to its newspaper guild, in the shape of a daily, called the *Telegram*. The editor, of course, attacked the local gas suppliers, and finally became so enthusiastic on the subject that he actually imagined he was a better gas meter than the one maintained on his premises by the Worcester gas folks. At any rate, the scribe asserted that one particular bill rendered was too high, that he would not pay it, but sent a check to the Company for what he thought was about right. Agent Rollins deposited the check, and promptly notified the "former of public opinion" that he still owed a balance on his account—the balance was about $34—non-payment of which within a certain time would cause his gas to be shut off. The scribe "came down" under protest, and then indited an editorial asking for signers to a petition praying the Gas Commission to investigate the affair and the Worcester Gas Company. By hook or crook he managed to obtain the desired number of signatures, and so the authorities stepped in. Although the whole thing looks like a veritable teapot tempest, it nevertheless will be followed with interest as showing what sort of metal is in the Massachusetts Commissioners, and the kind of treatment gas men are likely to receive at the hands of such bodies. This, we believe, is the first case in which the judicial portion of the Massachusetts Commissioners' power has been invoked, and we expect to give a comprehensive report of the proceedings with our next issue.

The Bouton Foundry Company.—Mr. Carl D. Bradley, who is well known to the fraternity from his former connection with the Union Foundry, etc., of Chicago, Ills., has been made Secretary of the Bouton Foundry Company, located at Nos. 2600 to 2626 Archer avenue, Chicago, Ills. The other associates in the new enterprise are Messrs. N. S. Bouton, E. G. Shumway, and F. W. Barker. The Bouton Foundry proprietors are to make a specialty of iron work for gas plants, and can be depended upon as reliable and efficient. It might here be said that Mr. Bradley severed his connection with the Union Foundry on the first of the year.

Partial Destruction of a Gas Works.—The new plant at Spencer (Mass.) was to have been ready for gas making on Jan. 13th, and that expectation may have been realized for all we know; but it is beyond doubt that no gas is being made there now, for the works were partially destroyed by an explosion which occurred in them on the afternoon of January 20th. The loss is reported at $6,000. Our details of the affair are far from complete, but as near as we can judge the buildings suffered most, although the machinery must have been pretty badly wrenched. The holder sustained no damage.

To Take Charge at Marlboro', Mass.—Mr. Wm. A. Anderson, who has been in the service of the Chelsea (Mass.) Gas Light Company for the past 16 years, took charge of the Marlboro' works on the 1st inst. We don't exactly see how Brother Andrew can fail to miss the services of one who stood by him so faithfully, and we are at a loss to comprehend how Mr. Anderson will be content in his new quarters without an occasional bout with his old-time friend and director at Chelsea. All speculation laid aside, however, we congratulate the Marlboro' folks on their luck in securing such a Superintendent, and hope that Mr. Anderson, who has taken a forward stride, will soon be ready to mount higher.

A Word from Dallas, Texas.—We are in receipt of the following interesting letter from Mr. Wm. Enfield, Superintendent of the Dallas City Gas Light Company. It bears date of Jan. 15. "I am kept very busy, as you may guess when I state that the Company's business has increased fully 50 per cent. within the last year. Our people are not disposed to be loud in their methods of doing business, nor do they seek display. They prefer to move on quietly, but not the less effectively. The local electric lighting company, with which I had been in conflict last summer, has put on new life and energy in the shape of a new directorate and management. The owners of the gas company were given to understand through a middleman, shortly before the 'change of life' was experienced, that the electric light plant could be purchased, and that if not so purchased the plant would be placed under more aggressive management, and pushed with far greater vigor than was the case in the past. I told said middleman (who, by the way, hails from Chicago, and claims to be agent for a water gas system that beats the world, but whose virtues he neither could describe nor figure out) that the owners of the gas company understood my views as to the operation of electric lighting plants by gas companies, and subsequently introduced him to the 'powers that be,' from whom he seems to have departed to stir up the promised aggressive warfare. The electric lighting system here consists of both arc and incandescent, the lamps being a Chicago product, and can be guaranteed to light, or not to light, according to circumstances—but the circumstances cannot be guaranteed. We feel pretty well and lively, thank you; and, though not seeking the fight, feel in condition for a vigorous defence. Dallas, as you may have heard, is growing very rapidly, and is now the best city in the Lone Star State. In addition to attending to the details of a business of an almost abnormal growth, I have had my hands full this last season in enlarging the works. A line of 12-inch main pipe, and a line of 8-inch pipe branching from it, with many smaller mains in the outlying districts; a 12-inch Connelly automatic governor; a 78″ × 78″ station meter; new pipes and connections throughout, making the plant an 8-inch one; a new regenerative furnace and setting of fives in an old arch; and last, but not least, tearing out a stack of 3 benches of threes and replacing them with a new stack of three benches of sixes, fired with the regenerative furnaces, were the much-needed improvements which I perfected successfully and without accident, and now have working to our entire satisfaction. One of the chief drawbacks to my labor has been the almost utter impossibility to secure skilled labor worth anything at all; and to mend matters I had a strike for the 8-hour-and-same-pay movement to start in on, when every man (lamplighters included) except the foreman left the works. This spring we build a new holder—sadly needed, too—of 110,000 cu. ft. capacity, the Kerr Murray Manufacturing Company having been awarded the contract. Dallas has every indication of a continued boom—which reminds me that I have no more time to spare, even if you could afford to peruse the uninteresting matter I might write." Mr. Enfield "might" write uninteresting matter; but since one must judge of what is to come by looking over that which we see, only one verdict is permissible from the inspection so made, in this case at least—and we think our readers will concur in the decision—for we decide that "interesting" has it by a large majority.

Paying the Piper.—When the project for lighting the streets of Troy (N. Y.) by electricity was first discussed it was estimated that 100 arcs would be sufficient for the purpose. At the present time about 250 arcs have been placed in position, and the end is not yet, notwithstanding the fact that the sum of $60,000 is now annually paid for the street lighting service. When gas was used exclusively the taxpayers were called upon to contribute but $24,000 per annum. Luxuries must be paid for, and the Trojans are paying a pretty penny for whatever luxury is extracted by them from between the carbon points.

Personal.—Mr. K. M. Mitchell, who formerly occupied the position of Superintendent to the St. Joseph (Mo.) Gas and Manufacturing Company, was presented by the employees of the latter Company with an elegant office chair when he resigned the berth above noted. Mr. Mitchell, as we are informed, is now in the service of the St. Louis (Mo.) Gas Trust. Mr. John H. Fitzgerald, of Park City, Utah Ter., assumed charge at St. Joseph, and we might explain that he is very well and favorably known by the Western fraternity, chiefly through his former business connections with the Kerr-Murray Manufacturing Company, of Fort Wayne, Ind.

Beginning the "Aggressive Warfare."—Since the receipt of Mr. Enfield's letter, which appears elsewhere in our item columns, we understand that the Dallas City (Texas) electricians have started the "aggressive warfare," threatened by them in case the owners of the Dallas City Gas Light Company did not buy out the electric plant, in the usual style—*i. e.*, they have trained their guns on the Council Board, and appear to have struck the target. We think so, at least from the fact that Alderman Carter succeeded in securing the passage of a resolution which directs the Mayor to appoint a committee of three "whose duty it shall be to inquire into the feasibility of lighting the city with electric light, and to correspond with the different manufacturers of electric plant in regard to the cost, etc., of the same." Also to obtain any other information they can secure in reference to the subject, and to report the same to the Council at as early a date as possible. Messrs. Carter, Loeb and Brown were named on the committee.

Denied a Charter.—Last Spring a combination of Pittsburgh and Philadelphia capitalists applied for a charter which would secure to the applicants an exclusive right to furnish fuel gas in the city of Philadelphia. It was proposed to operate under the name of the Hydrocarbon Gas Fuel Company, and the articles placed the initial capitalization at $1,500. The scheme no doubt was intended as the entering wedge of a goodly-sized grab of one sort or another, and considerable opposition was aroused. This culminated in the employment of counsel by the protesters, who were instructed to make argument before the Attorney-General, at Harrisburg, against the proposed grant. Messrs. Leaming and Wintersteen presented the remonstrants' side of the case, and argued so effectively that the Attorney-General decided adversely to the petition of the applicants. It is understood that this was regarded as a test case, for many similar applications, for other districts of the State, were pending. We have not received the text of the decision, but understand that the unfavorable ruling largely depended upon the "exclusive rights" portion of the conditions sought to be attained.

Annual Election.—At the annual meeting of the Williamsport (Pa.) Gas Light Company the following officers were elected: President, Hon. J. M. Gazzam; Sec., Treas., and Supt., Mr. C. A. Byers; Directors: J. M. Gazzam, R. P. Allen, J. G. Reading, B. C. Bowman, J. B. Coryell, H. Mudge, and J. G. Reading, Jr.

An Acknowledgment.—We are in receipt of copies of the American Meter Company's Pocket Almanac for 1887; also the Helme & McIlhenny Lighting Calendar for current year. These "annuals" are handsomely gotten up, and contain much of practical value for superintendents and engineers. We return thanks for the copies sent us. In passing, we may note that the annual issued by Sugg & Company, of England, resembles the American Meter Company's book closely enough in some respects to suggest the idea that Mr. Sugg's compiler had previously examined a copy of the "data sheets" so long a valuable feature of the American Meter Company's book. If we mistake not, Mr. Wm. H. Down originated the idea, and ought to get proper credit for it.

The Yonkers (N. Y.) Gas War.—It is understood that the gas war which lasted for such a length of time in Yonkers has terminated. The details of the truce are unknown to us, but Mr. Cornell, of the old Yonkers Company, is not the sort of man to conclude an armistice without having had a great deal to do with the framing of its provisions.

More Pay for other Pipers.—According to the Hannibal (Mo.) *Evening Post*, the electric plant owned by the city has been in operation but little over six months, and yet the items chargeable to repair account alone in that period foot up to about $2,000. Better get rid of the electrical annex to the city department, and so allow private enterprise to bear the brunt of the burden.

Electric Lighting at Rahway, N. J.—Last year the Tesla Electric Light and Manufacturing Company was granted a contract for lighting the streets of Rahway, and the system has thus far proved a complete failure. In fact, so wretchedly poor has been the service that a resolution has been passed by the Council directing the Committee on Lamps to wait upon the Gas Company in order to see what arrangements could be made with the latter for lighting the city until June next. The reference, however, cannot be expected to accomplish much in the premises, or in respect of working an abrogation of the Tesla contract, for when the Journal noted the award of the Tesla contract (see issue for July 2, 1886, page 12), we had occasion to write—in speaking of the impartiality (?) of the Rahway Lamp Committee—the following: "The Committee consists of three members, and of these two own the building which houses the Tesla plant, while the remaining 'impartial' is a member of the Tesla Company."

CAPITAL INCREASED.—The American Gas Company, of Philadelphia, Pa., has increased its capital stock to $500,000.

A FEW FIGURES FROM THE REPORT.—The Second Annual Report of the Massachusetts Gas Commission has been presented to the Legis'ature. We have not yet received a copy of the document, but the following figures and facts taken from the Boston *Journal* are presumably authoritative: Sixty-three companies now do business in the State; of these 61 made returns in compliance with the request of the Commissioners; 2 companies were organized under the general law during the year. The capitalization runs from $2,948 to $25,000 a mile of main; from $2.19 to $24.78 a thousand feet of gas sold; and from $22.56 to $150 a ton of coal carbonized. The companies received during the year, from all sources, $4,391,823.50, and of that $3,590,669.42 was for 2,091,210,980 cu. ft. of gas sold by meter. For gas supplied to public lamps $432,085.90 was received, and $341,020.76 for residual products. The total expenses were $2,896,745.92, leaving an apparent profit of $1,495,077,58. Interest, rent, etc., brought the profit up to $1,548,456.59. Dividends, interest, and other items paid amounted to $1,024,768.81, leaving a surplus of $523,687.78. Two of the companies failed to earn expenses, and seven others have not earned sufficient to warrant a dividend. The balance sheets from all but two companies show aggregate assets of $14,660,958.90, and a surplus of $1,801,967.09. The valuation of all the works assessed for local taxation was $12,188,868. The total taxes paid were $220,948.23—an average of 9.4 cents a thousand cubic feet of gas sold. There are now 40 electric light companies in active operation, with an aggregate capital of $3,500,000, and a capacity of about 5,500 arc and 30,000 incandescent lights." When we shall have received copies of the report we will refer to the statistics again.

MR. HINMAN'S ANNUAL REPORT.—Mr. Chas. W. Hinman, Inspector of Gas and Gas Meters for the State of Massachusetts, has handed in his annual report. From it we learn that during the year 10,604 meters were inspected. Of these 10,480 were either new or had just been repaired, and consequently were correct. The remaining 124, which had been in use and whose correctness was doubted, were reinspected, with the following results: 38 were fast, averaging 4.55 per cent. from correct; 64 were within the legal limit of 2 per cent. either way; and 22 were slow, averaging 12.43 per cent. from correct. The Inspector states that the inspections of the last 15 years show that although the number of gas consumers has greatly increased, the number of meters complained of has decreased about one-half. The proportion of fast to correct meters is about the same, however long the meters have been in use; and of slow meters to correct ones nearly twice as great as the general average, when the meters have been in use a long time. The general results of his tests, says the inspector, prove that the meters are no faster than they ought to be. The report contains much statistical matter in regard to the illuminating power of the gas furnished by the different companies, etc.

A PROPOSED TAX ON GAS SUPPLY IN VIRGINIA CITY, NEV.—Those in authority in the premises propose the passage of the following ordinance: "Every person, firm, association, or corporation engaged in the business of delivering or supplying gas to customers through gas pipes laid through and under the streets within the limits of the city of Virginia, shall pay quarterly for a license to conduct such business according to his, their or its average monthly receipts or sales, as in the following schedule: *First Class*—Monthly receipts or sales $4,000 or over, quarterly license, $100. *Second Class*—Monthly receipts or sales under $4,000 and over $2,000, quarterly license, $60. *Third Class*—Monthly receipts or sales under $2,000, quarterly license, $25."

MR. J. L. HALLETT TO SUCCEED THE LATE MR. MERRICK.—The annual meeting of the Springfield (Mass.) Gas Light Company was held on January 24th. Messrs. Chapin, Gunn, Rumrill, Lee, Porter, Hallett, and Hale were chosen directors. Mr. J. L. Hallett was made Treasurer, vice Mr. Wm. Merrick, deceased.

A Portable Coke Stove.

Messrs. E. Raffel & Co., of Copenhagen, have brought out an improved portable stove, and although the dimensions of same are comparatively small—the height of the stove being only three feet six inches, with a diameter of fourteen inches—it possesses a considerable heating capacity, coupled with great economy in fuel, the consumption being something less than two lbs. of coke per hour when in full operation. The stove completely consumes its own smoke, and will burn incessantly, night and day, for several months, the grate being so constructed that it can be easily cleaned and the stove refilled. The apparatus may be placed wherever an outlet can be obtained for the products of combustion, and, as the stove is fitted with wheels, it can be taken from one room to another, when required, and placed in front of the fireplace. The construction is very neat, and the external appearance does not suffer by use, as the inner stove containing the fire is surrounded by a cylinder of plate iron, the atmospheric air passing between the two. A vaporizing pan is fixed on the top of the stove for moistening the atmosphere, and the temperature is controlled by a ventilator fitted in the door. This stove has in comparatively little time met with a large sale, and several thousand are already in use, especially in Denmark and Sweden.

Annual Meeting of the Brookline Gas Company.

The Brookline (Mass.) Gas Company held its annual meeting on January 19th. The report of the President alluded to the successful operation of the Suburban Light and Power Company, in Brighton and Allston, and of the future possibilities of the same as a source of income. The shares of this latter Company can be purchased at any time at par by the Brookline Gas Company. A petition is now before the Legislature to extend the charter of the Brookline Company to include electric lighting, and it is believed that there is no opposition to it. A dividend of six per cent. has been declared the past year, and the profit and loss account shows a credit of $18,483. The Company has 50 miles of pipe now in the streets, and in a growing district. The price of gas was reduced in April to $2.20, and another reduction is looked for soon. The following named officers were elected: Directors, Robt. Amory, Wm. H. Hill, Jr., Francis W. Lawrence, F. H. Odiorne, A. W. Blake; Clerk and Treasurer, Francis W. Lawrence. It was unanimously voted, in accordance with the recommendation made in the report of the President, that the capital stock be increased to $450,000 by the issue of one thousand shares of $100 each. The President explained that the increase of capital stock was desired for the purpose of absorbing the Suburban Light and Power Company, and of taking up electric lighting, heating and power, if the charter should be so extended by the Legislature. At a subsequent meeting of the directors Mr. Robt. Amory was chosen President.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Mr. Egner in Reply to "A. S."

ST. LOUIS, MO., Jan. 23, 1887.

To the Editor AMERICAN GAS LIGHT JOURNAL:

On page 41, current volume of the JOURNAL, appeared an article, contributed under the *nom de plume* of "A. S.," that calls in question statements made in my communication published in your issue of December 16, 1886, p. 363. Now, "A. S." is mistaken in several things: First.—In assuming me to mean—where it is stated that a pound of coal (with oil) yielded 5.43 cu. ft. of 19.66 candle gas—that 2,211.2 lbs. of coal and 28.8 lbs. of naphtha yielded 12,163 cu. ft. of the gas. Having given the number of gallons of oil used per ton of coal, the writer wished to convey the idea that each pound of coal of that ton, aided by that number of gallons of oil per ton, gave the results stated—not a part of a ton of coal, but all of it, with the oil added. That accounts for some of the unaccounted-for pounds of gas noted by "A. S." Second.—One gallon of the St. Louis oil weighed 6½ lbs., not 6 lbs., as estimated by "A. S.;" and here we have a further hint in the accounting. Third.—In assuming the writer asserted that a certain number of cubic feet of 16 ("A. S." quotes 17) candle gas was all that could be obtained from a ton of the coal named. It is well known that in every retort house, under ordinary circumstances, more or less gas is being lost on account of leaky joints, porosity of the clay retorts, etc. If the exhauster is run fast enough to prevent this loss, we cannot help drawing in a trifle of air, or perhaps furnace gases; but at any rate 4.90 cu. ft. of 16-candle gas was all that the writer could obtain per pound of Youghiogheny coal when the latter was carbonized alone. When using the oil as described on p. 363, Vol. XLV., and again on p. 40, Vol. XLVI., we could so run the exhauster that the loss mentioned above was entirely prevented; and this addition to the yield, although secured from the coal, could not have been saved without the assistance of the oil, hence it was credited to the latter. Perhaps that will explain where some more of the gas, "the source of which cannot be discovered," came from. How many candle feet of gas may be obtained from a gallon of the grade of oil used in the Laclede works is an open question, and cannot in any manner be settled by assumption. The figures given in the "Chapter on Practical Gas Making" were taken from our carbonizing book, and were arrived at in the customary manner. The meter that registered the gas made was manufactured by the American Meter Company, and is fitted with an overflow, etc It was tested again quite recently, and its correctness proved to a dot. The figures given by "A. S." are interesting and instructive, even though based somewhat on probabilities and assumptions; but mine were founded on the recorded results. It is hoped the above may account for all that gas the source of which "A. S." could not discover. Let me assure him it really was made, and let me also express the hope that "A. S." will strike me from his list (if he has one) of visionaries, of whom he mentions that Ohio man as a sample. Yours, etc., FREDERIC EGNER.

The Market for Gas Securities.

The city gas share market has developed much strength. All classes of gas securities are higher. Consolidated, on large transactions, sold up as high as 86 and a fraction, then reacted somewhat, but is decidedly strong. At noon to-day (Jan. 31) sales were made at 85⅛. There is a well-defined impression that the Company, last year, earned pretty close to 6 per cent. on its capital. Equitable is active and strong, and Mutual is fairly well sustained. At auction, Jan. 26, 274 shares Consolidated, at 84¼; 200 Equitable, at 115¼; 101 Mutual, at 102; 25 Brush Electric, at 104. In out-of-town shares we note that Brooklyn classes are strong. Most observers say that in any event the Legislature will not make a compulsory rate for gas in Brooklyn at a figure below $1.50 per thousand. Louisville (Ky.) shares are higher. On Jan. 11th this Company declared a semi-annual dividend of 3 per cent. Augusta (Ga.) declared a 4 per cent. dividend on Jan. 19. Chelsea (Mass.) 3 per cent. Sales of Boston (Mass.) gas shares were recently made at 870; Newtown and Watertown (Mass.), at 140½; Roxbury (Mass.), at 190½. In fact a veritable boom appears to be in full swing.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

February 2.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	84¾	85
Central	440,000	50	30	—
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	115	117
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	113
Mutual	3,500,000	100	102	104
" Bonds	1,500,000	1000	101	—
Municipal, Bonds	750,000		—	—
Northern	125,000	50	36	—
" Scrip	108,000			
Yonkers		50	51	55
Richmond Co., S. I.	300,000	50	50	—
" Bonds	12,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	103	—
Citizens	1,200,000	20	—	68
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	135	—
" Bonds	300,000		--	106
Peoples	1,000,000	10	55	—
" Bonds	290,000	—	100	—
" "	250,000	—	100	—
Metropolitan	1,000,000	100	80	—
Nassau	1,000,000	25	101	—
" Ctfs	700,000	1000	100	—
Williamsburgh	1,000,000	50	123	—
" Bonds	1,000,000	—	107	—
Out of Town Gas Companies.				
Boston (Mass.) Gas Co.	2,500,000	500	870	875
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	140	145
" " Bonds	45,000	—	—	—
Chicago Gas Co., Ills	5,000,0000	25	142	145
Peoples G. L. & C. Co., Chicago, Ills	3,000,000		29	31
Cincinnati G. & C. Co.			198	200
Consolidated, Balt.	6,000,000	100	56	60
" Bonds	3,600,000		107	107½
Chesapeake, Balt.	1,500,000	100	79	80
"	1,000,000		100	102
Central, S. F., Cal.			82½	84
Capital, Sacramento, Cal.			55	58
Consumers, Toronto	1,000,000	50	194½	196½
Hartford, Conn	750,000	25	140	142
Jersey City	750,000	20	155	—
Laclede, St. Louis, Mo.	1,600,000	100	110	112
Louisville, Ky.	1,500,000	50	113½	115
Little Falls, N. Y.	50,000	100	95	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	209	215
New Haven, Conn		25	190	195
Oakland, Cal.			35	36
Peoples, Jersey City		—	25	30
" " Bonds			—	—
Paterson, N. J.		25	90	—
Rochester, N. Y.		50	75	80
St. Louis, Missouri	600,000	50	—	475
San Francisco Gas Co.				
San Francisco, Cal.	10,000,000	100	60¼	60½
Memphis (Tenn.) Gas	750,000	100	80	82
" Bonds.	240,000	100	103	—

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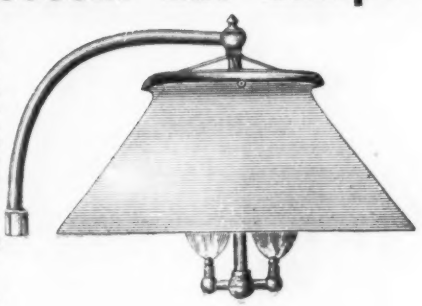

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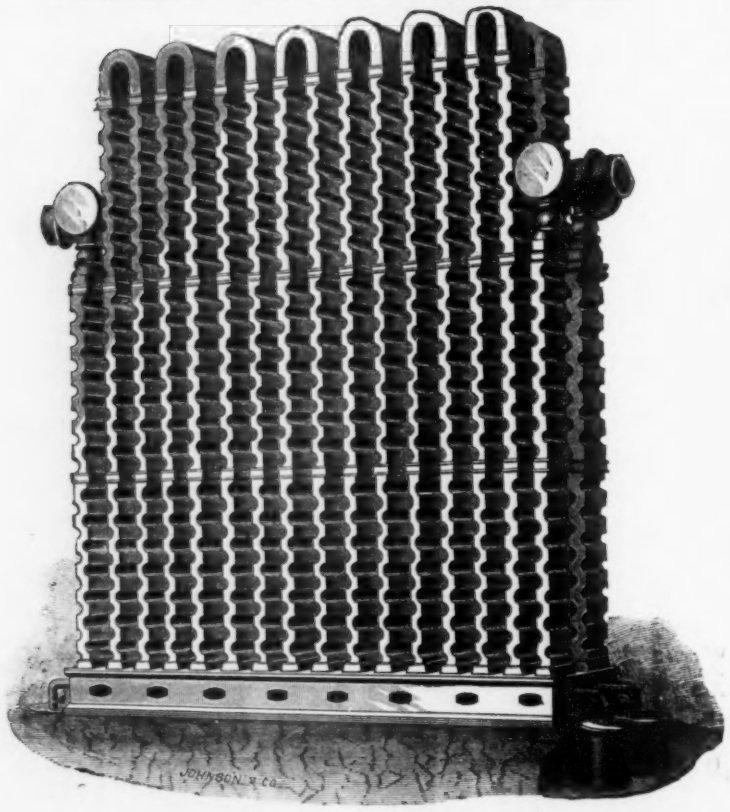

We desire to draw the attention of the gas community to the merits of the SINUOUS FRICTION CONDENSER. Companies intending to introduce new condensers into their works will do well to confer with us and examine plans and estimates before contracting for any other pattern The FRICTION CONDENSER is now in use at the gas works located in the following places:

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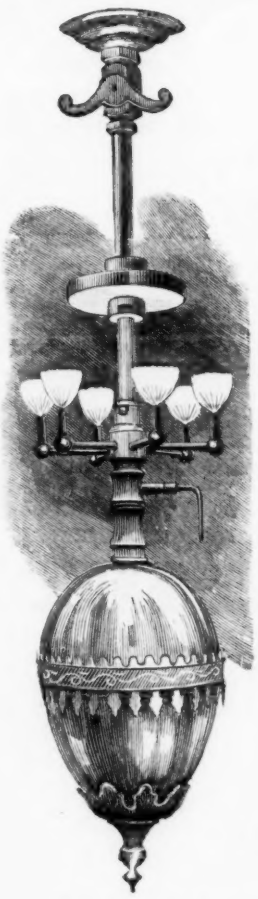

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This most successful of all methods of enriching gas is based on the use of heated gas to vaporize a solid hydrocarbon, thus

COMBINING THE ADVANTAGES OF PREHEATING AND CARBURETTING.

The incoming gas passes over an extended heating surface (heated by means of the illuminating flames), and is raised to the temperature necessary to vaporize the carburetting material, which is a white, crystalline solid prepared from coal tar.

INJUNCTION GRANTED!

In the suit between this Company as complainant and Newman A. Ransom and the Chicago Gas Apparatus Manufacturing Company as defendants, pending in the Circuit Court of the United States for the Northern District of Illinois, on a late hearing of said cause before his Honor, Judge Gresham, Judge of said Court, an order was made and entered therein, a copy of which is hereto annexed, supporting our charge of infringement of our Letters Patent No. 247,925, dated Oct. 4, 1881, and of our Letters Patent No. 333,862, dated Jan. 5, 1886, and sustaining our rights under said several Letters Patent, to which especial attention is hereby directed, viz.:

UNITED STATES CIRCUIT COURT.

Northern District of Illinois.

WALTER J. KIDD
vs.
CHICAGO GAS APPARATUS MANUFACTURING COMPANY AND NEWMAN A. RANSOM. } *In Equity.*

The Bill of Complaint and the affidavits filed by the respective parties having been read and the arguments of the counsel for the respective parties having been heard and duly considered by the Court—C. K. Offield, Esq., of Offield, Towle & Phelps, for the Complainant, and John H. Whipple, Esq., of Merriam & Whipple, for the defendants—and it appearing that Letters Patent of the United States were issued in due form of law to Joshua Kidd, No. 247,925, dated October 4, 1881, for an Improvement in Apparatus for Enriching Gas, also Letters Patent of the United States to said Joshua Kidd No. 333,862, dated January 5, 1886, for an Improvement in Carburetting Attachments for Gas Fixtures, and that the title to said Letters Patent vests by mesne assignments in the complainant herein; and it appearing by the answer of the defendant corporation, the Chicago Gas Apparatus Manufacturing Company, that they have never manufactured, used, or sold, or had anything whatever to do with any so-called apparatus for enriching gas of any kind or description whatever, or any carburetting attachment for gas fixtures of any kind or description whatsoever; and it appearing that said defendant, Newman A. Ransom, has infringed the second claim of said Letters Patent No. 247,925, dated October 4, 1881, and the first and second claims of said Letters Patent No. 333,862, dated January 5, 1886, by manufacturing and selling carburetting attachments for gas fixtures manufactured according to said Letters Patent contrary to the form of the statute in such case made and provided;

Now, therefore, it is hereby ordered, adjudged, and decreed, this 30th day of December, A. D. 1886, that an injunction be issued pursuant to the prayer of the Bill herein, strictly commanding and enjoining the said defendant, Newman A. Ransom, his clerks, attorneys, agents, servants, and workmen that they forthwith, and until the further order, judgment, and decree of this Court, desist from the making, using, or selling of any carburetting attachments for gas fixtures substantially as described and claimed in said Letters Patent in said above identified claims thereof; and that the complainant enter into Bond to be approved by the Clerk of said Court in the penal sum of two thousand dollars ($2,000), to said defendant, Newman A. Ransom, conditioned to pay the defendant or his legal representative all such costs and damages as shall be awarded against the complainant in case the said injunction shall be dissolved, said Bond to be filed on or before the 22d day of January, 1887.

and our suit against W. S. Horry (trading as the Crystal Carbon Light Co.), Arthur Kitson (trading as Kitson & Co.), and others, defendants, for infringement of our Letters Patent above mentioned and referred to, pending in the Circuit Court of the United States for the Eastern District of Pennsylvania, has not yet been reached for hearing.

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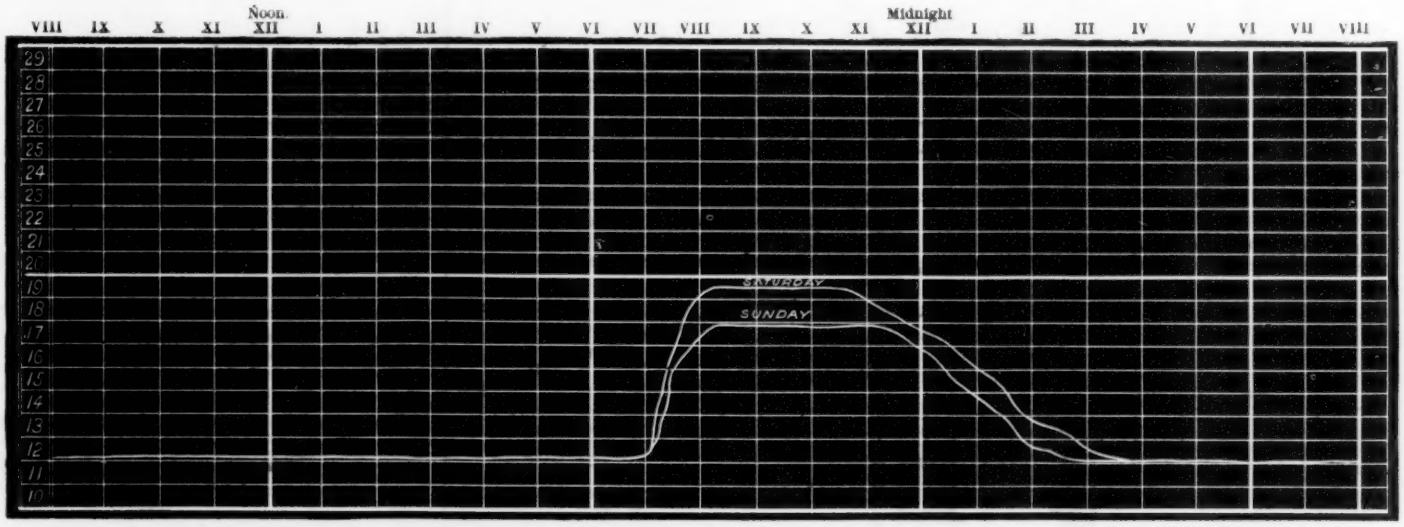
A Governor that puts the increased pressure on at "one fell swoop" and takes it off in like manner is *not* an "Automatic" Governor; and the circulation of pressure sheets showing such action by a so-called "Automatic" Governor is a rather amusing reflection on the intelligence of Gas Managers.

Strictly speaking, a "Balanced" Governor is an "Automatic" one, as it automatically varies the volume of gas sent out to *maintain a uniform pressure* at its outlet. But, as now applied, the term "Automatic Governor" is understood to mean a Governor that will *maintain pressure between any two desired extremes, in direct proportion to the volume of gas consumed.* Therefore pressure sheets showing *instantaneous changes* from maximum to minimum and *vice versa*, circulated broadcast as the record of an "Automatic (?) Governor," reveals inexcusable ignorance of the subject, amusing to many, yet liable to mislead the inexperienced novice.

We would suggest that all Gas Companies contemplating the placing of *Automatic* Governors would consult their own interests and avoid annoying experience by adopting a Governor *that has a record.*

CONNELLY & CO., LTD., 177 Broadway, N. Y.



Card Showing Pressure at the Milwaukee Gas Works, Saturday, July 10, and Sunday, July 11 1886.

MILWAUKEE, WIS., August 3d, 1886.

MESSRS. CONNELLY & CO., LTD., 177 Broadway, New York:

Gentlemen—Replying to yours of 29th, I send you a little package of register sheets. When your Governor (20-inch) was set I adjusted it to give 13-tenths day pressure and 22-tenths night pressure. Saturday nights it would run up to 25-tenths. Whenever it would cloud up in the daytime it would go up at first indication of darkness to about 15-tenths. I hunted back in the sheets to find one when pressure was increased in the daytime, but it is so long since we have had a stormy day I could not find one. You can, however, see a *slight change* on sheets for June 1 and June 25. You will see, too, that lately the Governor only puts on *about* 20-*tenths maximum pressure.* This is because *less gas is burned than when it was adjusted.* We have no complaints of pressure, and everyone appears satisfied. In conclusion, can say the Governor has *never been touched* since it was first adjusted, and has at all times *done just the work we wished it to do.* Very truly yours, E. G COWDERY, Engr. & Supt.

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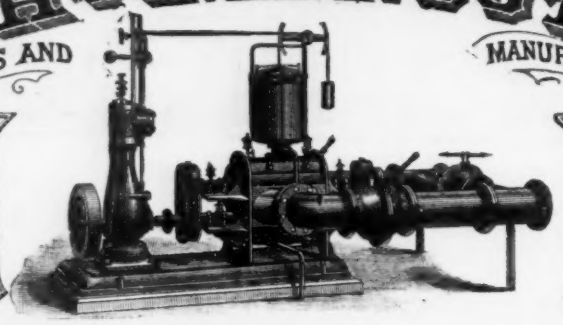

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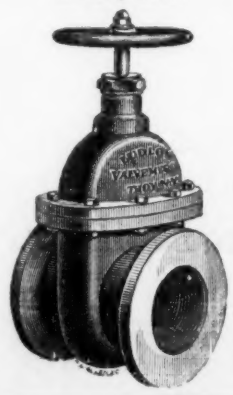

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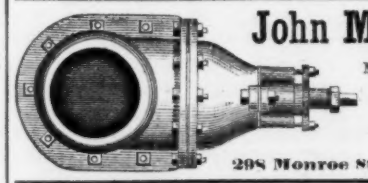

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Man'facturer of

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We would invite attention to the able and exhaustive argument of General A. Hickenlooper, President of the Cincinnati Gas Light and Coke Company, contained in a handsome pamphlet of 96 pages, entitled

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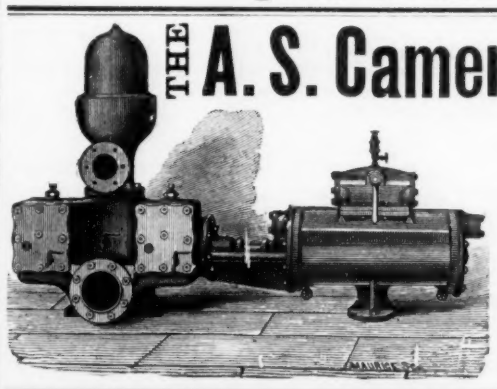

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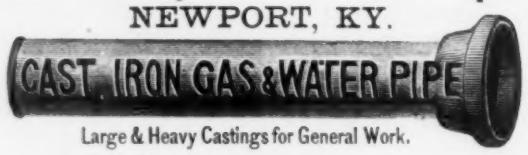

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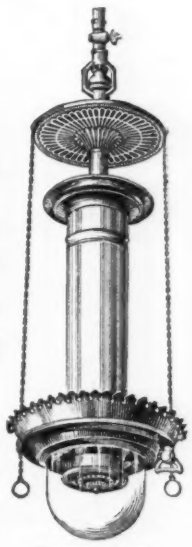

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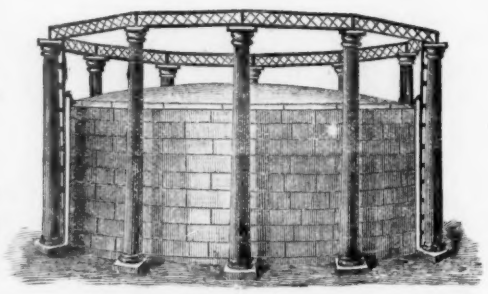

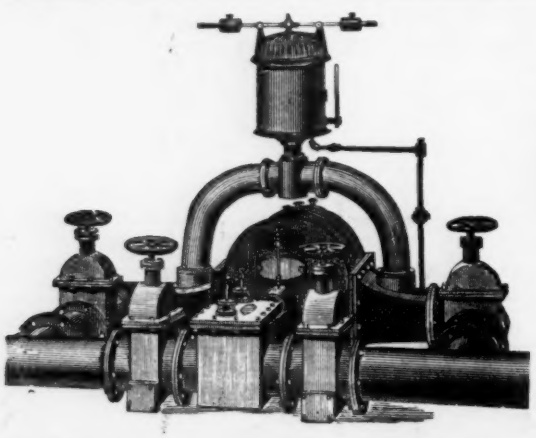

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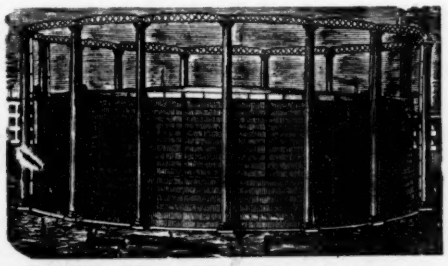

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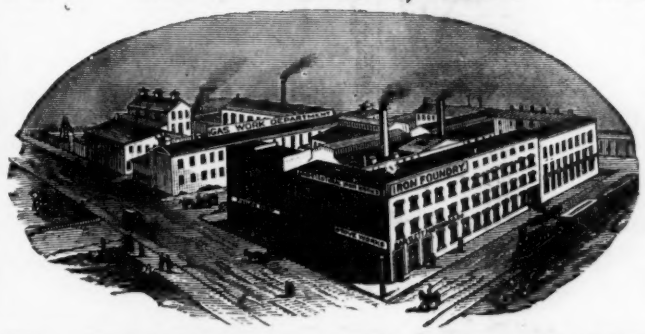

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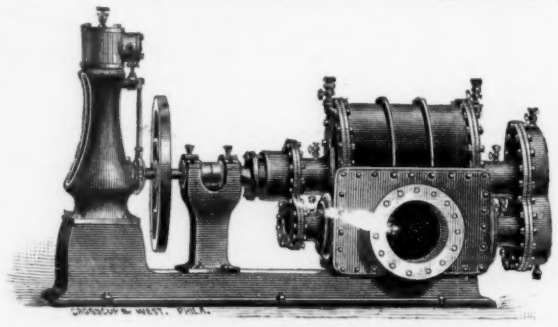

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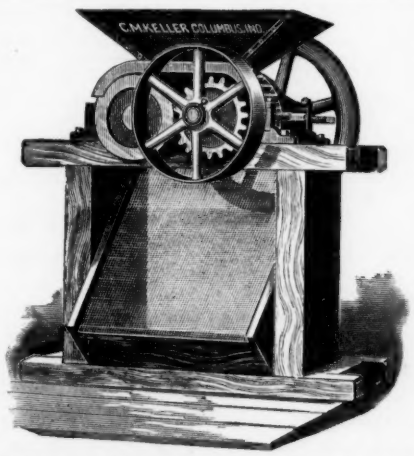

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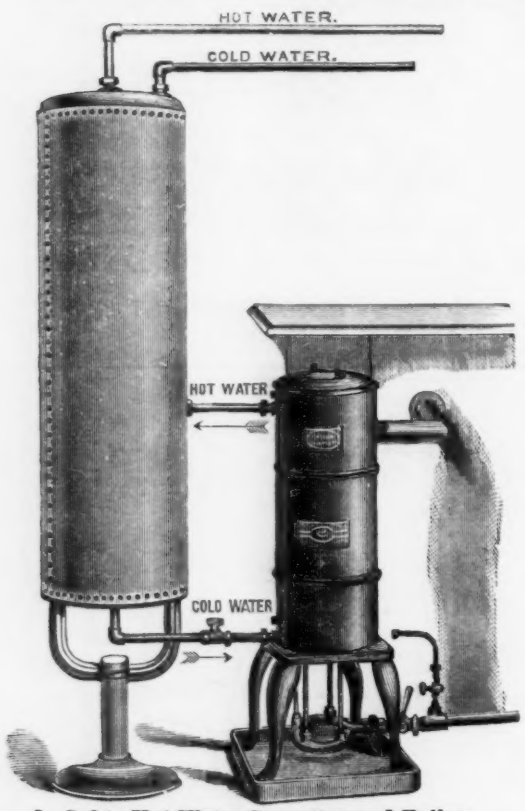

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